Amendments to the Drawings

Attached are replacement sheets including Figs. 8-14. These sheets replace the original sheets including Figs. 8-14. As with the drawing sheets as originally filed, each replacement drawing sheet includes one figure per page. The two drawing sheets containing Figs. 8 and 9 have been amended to eliminate any erasures, alterations, overwritings, interlineations, folds, and/or copy machine marks present on the drawing sheets as originally filed. These drawings sheets and the drawing sheets containing Figs. 10-14 have been amended to provide line numbers and letters which are uniformly thick and well defined, clean durable and black.

REMARKS/ARGUMENTS

Applicants respectfully request reconsideration of the above-identified application. With the present amendment, claims 1, 29, and 38 have been amended. Claims 15-18 have been withdrawn as being directed to the non-elected invention. Replacement drawing sheets are provided for Figs. 8-14.

I. Claim Objection

In order to overcome the objection to claim 1, line 15 has been amended to recite --an-- rather than "a an".

II. 35 U.S.S. § 112

Claims 1, 29, and 38 have been rejected under 35 U.S.C. § 112, second paragraph as being indefinite for failing to point out and distinctly claim the subject matter that applicants regard as their invention. In particular, the Examiner has noted that in line 1 of claims 1, 29, and 38, "the method" lacks antecedent basis. Applicants have amended these claims to recite -- A method--.

The Examiner also identifies the phrase "highest optimized business value" in claim 1 as being vague and indefinite. Applicants respectfully disagree and refer the Examiner to the specification at page 11, line 11 to page 13, line 4 where the phrase "highest optimum business value" is defined. As that portion of the specification explains, the highest business value is used to compute a maximum business value of an application. Specifically, the highest optimized business value comprises one or more predetermined enablement attribute constructs for the application. For example, the enablement attributes may be availability, flexibility, security, etc. The enablement attributes may be provided as a multiplier or coefficient applied to the actual application value. Alternatively, a summing procedure also may be employed. Thus, the highest optimum business value of an application is the actual value of the application increased by the applied enablement attributes. Because of the highest optimized criteria applied with these constructs, the business value of the application represents an upper bound for the target application net business value. This gives the analyst an opportunity to comparatively evaluate the organization specific net business value of the target application against what will be an optimum valuation which could only be accomplished in a perfect business world. Having defined what it is and how it is calculated and applied, Applicants submit that the phrase "highest optimized business value" is neither vague nor indefinite.

III. Requirement for Information under 37 C.F.R. 1.105

The Examiner has requested any known publications, brochures, manuals, and press releases that describe the "2.0 SAN Value Tool" software product, "ITCentrix Special Report" and the "ZD Studios' New World Network Conference Series..." presentation.

Responsive to the Examiner's request, submitted herewith are copies of the following documents:

(1) November 1, 1999 press release regarding the SAN Value Software

(2) Document entitled "SAN Value Model"

(3) Press Release regarding ZD Studios' New World Network Conference Series

(4) Draft Position Paper for the ZD Studios' New World Network Conference Series

IV. Double Patenting

Claims 1-14 and 29-49 have been provisionally rejected on the ground of non-statutory obviousness-type double patenting over claims 1-14 and 27-30 of co-pending application U.S. Serial No. 10/053,304. Upon indication that one or more claims are allowable in the present application, Applicants will submit a terminal disclaimer.

V. 35 U.S.C. § 101

Claims 1-14 and 29-49 stand rejected under 35 U.S.C. § 101 as being directed to non-statutory subject matter.

First, the Examiner notes that the claims recite a series of steps and are considered for the purpose of analysis under 35 U.S.C.§ 101 as reciting a series of steps. By this statement, Applicants assume that the Examiner is noting that the claims fall into the category of a process as opposed to a machine, manufacture or composition. The Examiner goes on to say that a process is statutory if it requires physical acts to be performed outside the computer independent of and following the steps performed by a programmed computer, where those acts involve the manipulation of tangible physical objects and result in the object having a different physical attribute or structure.

The Examiner's initial argument reflects the requirements for physical limitations and physical transformation which are part of the *Freeman-Walter-Abele* test. As noted by the Federal Circuit, "Whatever may be left of the earlier test, if anything, this type of physical limitations analysis seems of little value because 'after Diehr and Alappat, the mere fact that a claimed invention involves inputting numbers, calculating numbers, outputting numbers, and storing numbers, in and of itself, would not render it nonstatutory subject matter, unless, of

course, its operation does not produce a 'useful, concrete and tangible result.'" AT&T Corp. v. Excel Communications, Inc., 172 F.3d 1352, 1359, 50 U.S.P.Q.2d 1447, 1453 (Fed. Cir. 1999), citing State Street Bank & Trust Co. v. Signature Financial Group, Inc., 149 F.3d 1368, 1374, 47 U.S.P.Q.2d 1596, 1601 (Fed. Cir. 1998). As such, the analysis of whether or not the recited claims involve the manipulation of physical objects is irrelevant to the claims at hand.

As the Examiner notes a mathematical algorithm applied in a practical manner to produce a useful, concrete and tangible result does meet the requirements of §101. With respect to the present claims, the Examiner states that "While these numbers may be concrete and/or tangible, there does not appear to be any useful result." In response, Applicants point to State Street Bank wherein the Federal Circuit held that the processing system at issue was patentable subject matter because the system takes data representing discrete dollar amounts through a series of mathematical calculations to determine a final share price - a useful, concrete and tanglbie result. Even though the claims at issue in State Street Bank involved a system rather than a process, the Federal Circuit expressly stated in AT&T that, "we consider the scope of § 101 to be the same regardless of the form -- machine or process -- in which a particular claim is drafted." In that case, claims reciting a process for using data and Boolean algebra to generate a signal useful for billing purposes were held to be statutory subject matter under §101.

Applicants' claims are very similar to those involved in the State Street Bank case. Here, the claims involve performing a series of calculations to determine an organization specific value of an information technology application. See independent claims 1 and 29. This output clearly is tangible and concrete in that following the method always produces a value, (e.g., a number), associated with the information technology. In claim 29 the output is a series of net business values for a series of information technology applications (e.g., first through n^{th} applications). The method also produces a useful result. As noted in the specification, evaluating the business impact or dynamics of additions or improvements to initially installed legacy IT systems has been an illusive goal for business analysis, posing the dilemma of at least partially hunch-base procurement decisions on management. Application, page 3, lines 4-7. The claimed invention solves this problem by deriving the noted net business values for IT applications. "By comparing and contrasting the derived net business values evoked by various alternative changes, the analyst is afforded the opportunity to more accurately devise an optimal mix of system variations and combinations to enhance the overall value of an organization specific information technology system." Application, page 4, lines 3-6. Because the claims

produce a useful, concrete and tangible result, they meet the requirements for patentability under §101.

VI. 35 U.S.C. § 103

Claims 1-14 and 29-49 stand rejected under 35 U.S.C. § 103(a) as being obvious in view of "A graphical method for assessing knowledge-based systems investments" (referred to hereinafter as "Graphical Method"). The Examiner cites pages 2-4 of the Graphic Method as disclosing many of the elements of the claims. The Examiner does admit that the Graphical Method fails to disclose "a method for modifying maximum said business value of said application in correspondence with a derived operational cost of said application in correspondence with a derived operational cost of said application to derive the net business value of said application as said organization specific value." Despite this failure, the Examiner contends that the Graphical Method teaches the value of an application being determined on perceived costs and that, therefore, it would have been obvious to the skilled artisan to modify the method of Graphical Method and include modifying the business value corresponding to a derived operational cost because it greatly improves the accuracy of the valuation process if all the determinants are considered in order to determine an accurate value.

The Graphical Method reference discloses a method for valuing a specific system, namely, a knowledge-based system (KBS). Such systems represent knowledge in the form of heuristics for solving problems to assist humans in making decisions. Determining the potential value of a KBS to a company is significant as the cost to develop such a system may range from several hundred thousand to several million dollars. The article begins by pointing out that, in the past, KBSs were measured using conventional valuation methods such as return on investment, internal rate of return, cost benefit analysis and net present value. These methods are flawed because they measure tangible costs and benefits but do not take into account intangible costs and benefits. Responsive to these inadequacies, the authors of Graphical Method developed a method specifically tailored for assessing KBS investments. Such specific tailoring is required for KBSs because such systems embody additional costs and benefits absent from conventional systems. KBSs also include key employee groups not present in other systems, and, thus, proper valuation requires determining the employee perceptions from more employee groups. To address these novel features of KBSs, Graphical Method proposes to adapt the theory of reasoned action (TRA) to guide the measurement of employee perceptions of KBS value.

At pages 2-4, cited by the Examiner, the authors of Graphical Method distinguish their approach from several traditional valuation methods. As noted on page 2, traditional valuation methods do not provide information on intangibles, which for KBSs is crucial. On page 3, the authors also distinguish their method from linear additive methods and profile charts. Linear additive methods use a human valuator to rate the contribution to value of both tangible and intangible costs and benefits. An attempt is then made to weight the relative importance of these costs and benefits to a system's value. The weight and rating for each cost and benefit are then multiplied and the resultant products summed to attain a numerical score of the system's value. Profile charts are non-numeric instead using a shading technique to visualize the degree to which each project attribute is a cost or benefit. Profile charts do not attempt to weigh the relative importance of a set of costs and benefits pertaining to a system; they simply provide information on costs and benefits of each project independent of other projects.

Both of the linear additive and profile chart methods are rejected by the authors because neither attempts to measure the perceptions of organizational employees who interact with the system. Instead, these alternative methods utilize a single human valuator to measure the value of the system. The solution proposed by the authors is an adaptation of the profile method, called a graphical KBS valuation method. This adaptation differs from traditional profile charts because it utilizes the perceptions of key employee groups involved in KBS development. Costs and benefits are identified and classified into categories, such as time, finance, and quality. Key employees measure the value of these costs and benefits at the end of each life-cycle phase of the KBS to determine if the KBS should proceed to the next stage of development. Valuation data is collected by surveying the key employees. The collected data then is presented in a graphic form, illustrating the key employees perceptions of the costs and benefits (e.g., time, finances, and quality) of the KBS. (see Graphical Method, pages 4-11).

Turning to claim 1, it is clear to see that the specific claim features of the invention are not disclosed in Graphical Method. First, it should be noted that claim 1 involves a quantitative analysis, calling for the derivation of values and coefficients to determine a net business value of an application. This should be distinguished from the KBS value graph method disclosed, as well as the traditional profile chart method from which the KBS value graph method is adapted. As noted on page 8, words and graphs are believed to be more meaningful than "a non-descriptive number." This should be compared to the present invention, whose goal is to provide a net business value represented in terms of a common currency, for example, dollars.

From Graphical Method it may be seen that many factors have been identified as relating to the value of an application. The differences among the different valuation methods,

however, are the selection of the factors to be used and the way in which the factors are manipulated to determine the value of an application. As is evident from the summary of Graphic Method provided above, the reference clearly does not disclose steps (b), (c), (d), or (e) of claim 1. As such, this publication cannot anticipate or render obvious the claimed invention.

Claim 1 initially recites the step of deriving a base application value corresponding with the cost of an application use cost construct. Step (a). Once the base application value has been determined, a business experience based coefficient is derived, which represents the relative productivity contribution of the cost construct. Step (b). This coefficient represents the relative productivity contribution represented by the application cost construct. This coefficient is derived from a set of experiences of similar target applications in other organizations or companies as well as organizations represented by the target application. This coefficient may be derived, for example, from relative generation of revenues, profit contributions, productivity, market cap, budget reduction, etc. The business experience based coefficient exhibits a strong dependence on the current state of the information technology associated with the application being valued. Such a coefficient is neither disclosed nor suggested by Graphical Method. The business experience coefficient is applied to the base application value to provide an actual application value. Step (c).

Once the actual application value has been determined, it is increased by the value of the highest optimized business value of an enablement attribute construct. Step (d). This is an optimized valuation where the enablement attributes are non-constraining and represent a perfect business world. One of the attributes of the invention is its ability to derive a value for an application particularly with respect to a proposed change or variation to the application. By adjusting the enablement attributes to reflect proposed changes, one may see the corresponding change to the maximum business value of the application, and, thus, its net business value. These enablement attribute constructs will include, for example, the value of the availability of the application with respect to the applied change or variation; the value of flexibility of the application with respect to the applied change or variation; the value of security of the application with respect to the applied change or variation; and other elected enablement attribute constructs suited to a particular information technology system. The use of an enablement attribute construct to determine a maximum business value is nowhere disclosed nor suggested in Graphical Method.

Once the maximum business value has been provided, it is modified in correspondence with a derived operational cost of the application to derive the desired net business value of the application. Step (e). As the Examiner notes, this step is not disclosed in Graphical Method.

As noted above, it is the Examiner's position that it would have been obvious to the skilled artisan to modify the method of Graphical Method and include modifying the business value corresponding to a derived operational cost because it greatly improves the accuracy of the valuation process if all the determinants are considered in order to determine an accurate value. Applicants respectfully disagree. As noted above, a wide variety of determinants have been identified as impacting the value of an application. It is the selection of determinants and their relationship to one another that distinguish one valuation method from another. For example, in the present method, the operational costs are subtracted in their entirety. If the maximum business value of the application were not determined, then potentially the value of the application might be better reflected if only a portion of the operational costs were subtracted. Alternatively, a weight could be assigned to the operational costs so that the fraction of operational costs subtracted might depend on the specific application. Applicants respectfully request that the Examiner submit a reference or affidavit in support of the position that it greatly improves the accuracy of the valuation process if all the determinants are considered in order to determine an accurate value.

In view of the recited elements missing from the Graphical Method reference, it clearly cannot anticipate or render obvious claim 1 of the present application. Claims 2-14, which depend from claim 1, should be considered patentable for the reasons given above.

Independent claim 29 recites a method for determining net business values of first through nth information technology applications. Claim 29 substantially follows the steps recited in claim 1 for a plurality of information technology applications. For the reasons given above, the Graphical Method reference does not disclose steps (b), (c), (d) or (e) of claim 29 and therefore cannot anticipate or render obvious the claimed invention. Specifically, the Graphical Method does not disclose or suggest adjusting each base application value by a business experience base factor. It also does not disclose deriving a potential business value for each application using the perceived value of an enablement attribute construct. Finally, it does not disclose or suggest removing operation costs to arrive at a net business value for the plurality of application.

Claims 30-49 depend from claim 29 and should be considered patentable for the same reasons.

VII. Declaration of Inventorship

The Office Action Summary indicates that, "The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152." Applicants note that the Office

Action does not address the declaration and a form PTO-152 was not attached to the Office Action. On March 9, 2006, the undersigned telephoned the Examiner, who indicated that he believed the defect in the declaration is the absence of the provisional application information to which the present application claims priority.

To correct this defect, applicants submit herewith a supplemental declaration identifying the provisional application, U.S. Serial No. 60/250,742 filed December 1, 2000. David P. Vellante and David A. Flowers have signed the supplemental declaration. Also included herewith is a Petition Under 37 C.F.R. 1.183 and MPEP § 603, requesting that the Commissioner waive the requirement for inventor Edward Gershenson to sign the supplemental declaration as he was presented with the supplemental declaration and has refused to sign it.

VIII. Conclusion

In view of the foregoing, Applicants earnestly solicit a Notice of Allowance for all elected claims 1-14 and 29-49.

Respectfully submitted,

Date: June 21, 2006

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CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited on June 21, 2006 with the United States Postal Service as first class mail in an envelope addressed to:

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Jane Keeney

ITCentrix Announces Delivery of its SAN Value Software

STILL RIVER, MA - November 1, 1999 - ITCentrix, a leading developer of innovative IT decision support solutions, today announced it has begun shipping Version 2.0 of the SAN Value Tool. The software announced is a standalone, Windows-based decision support application designed to help IT and Business Professionals assess the business value of a SAN infrastructure. The tool, uses the ITCentrix Value Framework to quantify value in three areas, including:

Cost Savings;

Availability Value;

The Value of Faster Application Deployment.

The software includes an easy-to-use front-end interface complete with online help functions to assist users in applying the Rapid Assessment Methodology developed by ITCentrix.The software presents an "apples-to-apples" business case for a variety of different storage approaches including:

Distributed Storage - outside of a data center;

Collocated Storage - moved into a data center;

Basic SAN - involves rudimentary any-to-any connectivity between servers and I/O;

Enhanced SAN - includes more sophisticated volume and fabric management in addition to other software functions;

Future SAN - is a fully enabled SAN offering with dynamic workload and volume management in addition to a global file system.

The software was developed with inputs from Global 2000 and smaller organizations and contains comparative industry information to allow customers to predict costs and benefits based on such factors as workload and complexity of environment. To develop the software, ITCentrix used its database of storage customers that currently includes more than 300 data points on storage management effectiveness within large and medium sized organizations in the U.S. and Europe.

Commenting on the announcement, Dave Vellante, President of ITCentrix said, "In five months we have gone from proof-of-concept to a fully operational, revenue-producing software tool. Our customers are pushing us to add new function at a fast pace and we're excited about the prospects of not only enhancing this software but applying our framework to new technology areas."

Version 2.0 of the ITCentrix SAN Value Tool currently is available to assess SAN infrastructure in Unix and NT environments with future platforms expected in the first half of 2000.

About ITCentrix

ITCentrix is a pre-IPO software and services company founded in 1999 by leading business and technology experts. The company develops powerful decision support software and complimentary services to help its clients make rapid, high quality decisions in their specific business context. ITCentrix has performed numerous of assessments in Global 2000 and smaller organizations using its proprietary software and Rapid Assessment Methodology to help companies avoid costs, improve service levels and accelerate time-to-market.

SAN Value Model

ITCentrix, Inc.

Infolink Overview

Table of Contents

Introduction

Current IT industry analyst data supports the premise that in order to penetrate high-level enterprise customer accounts, IT vendors must be able to sell directly to the highest levels of management, in terms of "business value."

In response to this need, Enterprise Storage Marketing has invested in the development of a "business value" selling tool. The tool was designed to equip Compaq's sales reps and storage specialists with a means for identifying, soliciting, and quantifying the "business value" of a storage architecture and strategies within a customer's enterprise computing environment.

Objectives

After a full review of these infolinks, users who meet the prerequisites will be able to:

1.) Define the term "value selling" in the IT business framework.

2.) Identify and define the five stages of value selling.

3.) Identify the key components of the SAN Value Model.

4.) Apply the model to target Compaq SAN infrastructures.

5.) Calculate application values given specific customer case studies

Prerequisites

These infolinks are designed for Compaq storage specialists and sales representatives who have at least two years of success at selling Compaq StorageWorks Solutions. Users should also have specific product training in Compaq SAN solutions.

Infolink Overview

Module I: What Is Value Selling?

What Is Value Selling takes a close look at the relationship between IT business value and value selling and how value selling directly connects to the business and measures change.

Module II: The Five Stages of Value Selling

The Five Stages of Value Selling includes a detailed description of each stage as well as tips and suggestions for each.

- Stage 1: **Establish** – an interest and need
- Stage 2: **Engage** – in a substantive discussion of value
- Stage 3: **Advise** – your client on a new approach
- Stage 4: **Apply** – the approach to your customer's environment
- Stage 5: **Agree** – on a follow-up action plan

Module III: Using the Value Software Tool

The following seven steps are used to assess a customer's storage infrastructure:

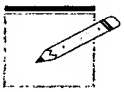
Step 1: Assessing the overall IT Infrastructure
Step 2: Assessing Operational Costs
Step 3: Assessing the Target SAN Infrastructure
Step 4: Assessing the Value of SAN Applications
Step 5: Applying Application Value to Availability
Step 6: Applying Application Value to Flexibility
Step 7: Delivering Results

Module IV: Case Studies

This section is composed of case studies based on real information from actual client data.

Naming Conventions and Icons

The purpose of this section is to provide the user all the naming conventions and icons within the Infolinks. Refer to the table below.

Icon/Name	Description
Note:	Indicates that the information that follows is very important.
Reference:	A reference pointer refers to additional information within the guide
	This icon represents a ***tip or suggestion.***
	This icon represents a sample screen from the tool.
	This icon represents a notes page.

Introduction to Value Selling
Module 1

What Is Value Selling?

Value Selling is the process of helping the customer connect IT to the business and measuring the change. The process involves considering the customers' IT in business value terms and helping the customer to think logically about ways to understand the link between business and IT. While ultimately the goal is to sell a solution, value selling demands that you establish credibility with the customer by providing advice and counseling on new ways to think about IT planning; independent of products and services.

Why Value Selling?

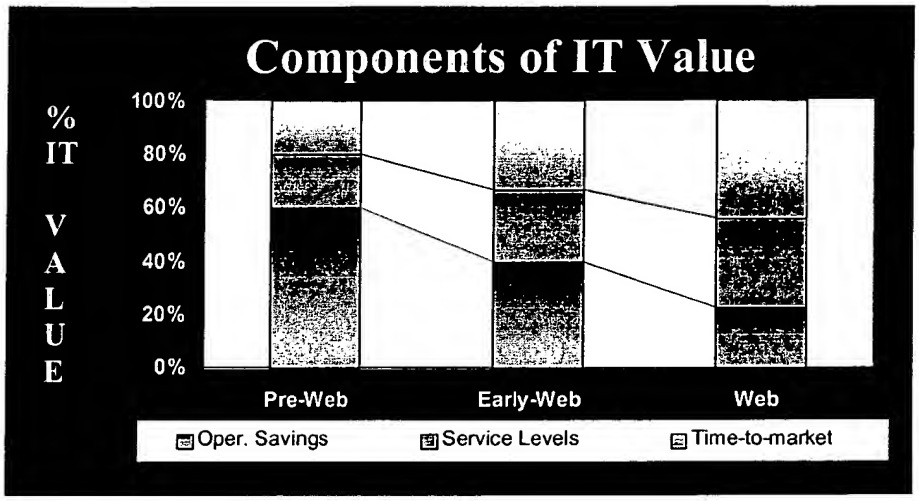
The reasons for value selling are generally accepted. By selling value, you can appeal to higher levels within the organization, command better prices and establish better relations with the customer. Typically, no one person has an overall view of an enterprise, and value selling can open the door to many functions within an organization. Examples of this are:

- Applications Groups
- CIOs
- Business Management

Presenting this comprehensive view strengthens your credibility and adds value to the customer

How the Perception of Value is Changing

Through case studies with dozens of Global 2000 (and smaller) corporations and other government and non-profit institutions, it is becoming increasingly clear that the perception of IT Value is changing (see figure below).



Source: ITcentrix, Inc. - 1999

Catalysts for Change:

- Decades of IT investment focused on Internal Issues
- The "Web effect" changes priorities from internal to external
- Customers are re-architecting IT to face the customer
- Customer Service Levels and Time-to-market are becoming more important

Practical Examples:

- What would it have meant to barnesandnoble.com to get its Web site up six weeks earlier?
- What's more important to eBay, cost savings or availability?
- Do you have a Web example du jour?

Re-enforce to customers that operational cost savings are still crucial. Emphasize, however that other value factors must be considered and that traditional value tools like ROI and TCO, while complimentary, only address part of the equation. Customers today need to avoid "rear view mirror" planning and anticipate changes to their business models.

The Five Stages of Value Selling

Module 2

Purpose

The purpose of this module is to provide storage specialist and sales representatives with a detailed understanding of the five stages of value selling, as well as guidelines for value selling to customers.

What's in this Module?

The following stages are included in this module.

Stage I: Establish Interest and Intent

Establish with customers that you would like to explore the "business value of IT." Start by explaining to customer:

- That you have worked with an independent firm, ITcentrix Inc. to develop a strategic model to assess the value of a storage infrastructure.
- That you would like to discuss various aspects of the customer's IT infrastructure with the intent of assessing the business value contribution of a storage approach.
- That the model boils value down to three factors:
  - Operation al Cost
  - Service Levels
  - Business Flexibility

Help the customer understand that this model was developed from interactions with numerous large and medium-sized companies and that the exercise has value in and of itself.

Stage II: Engage In Discussion of IT Value

During this stage, engage the customer in an initial discussion of value by asking a series of questions.

- Does you company formally measure IT value?
- How does your company measure IT value?
- What tools do you use ? TCO? ROI? Others?
- Do you formally track the value of an IT project? How?
- Is the perception of IT value changing within your company?
- Is your company increasingly willing to invest in IT to increase revenue or... customer satisfaction?
- Do your competitors look at IT value differently than your company? How?

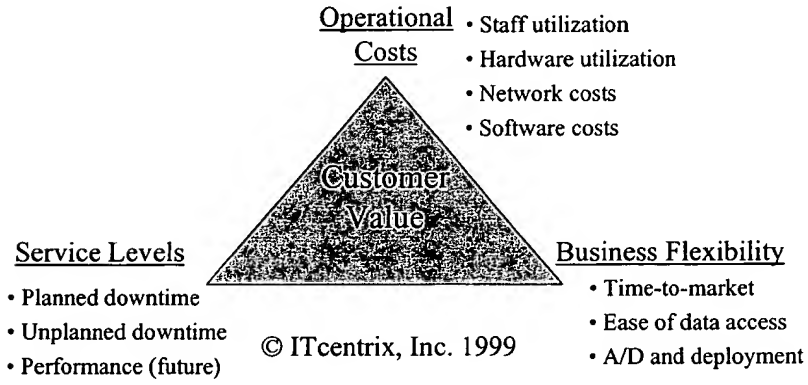
Reference: See Appendix E - Science of Selling-Opportunity Assessment Questions

Stage III: Advise Customer on New Approach

What is the ITcentrix Value Contribution Model?

The ITcentrix Value Model is a tested methodology that combines cost, technology and business modeling to more accurately predict how changes in IT will impact business results. It is a tool developed by an independent company built within a strategic framework to assess IT's contribution to business value. Data from the model is calibrated using real world studies of Global 2000 and smaller corporations.

The ITcentrix Value Contribution Model



The model uses assumptions based on actual customer data and allows users to make changes to reflect specific applications and environments (e.g. application value, levels of availability, planned downtime, network cost, etc.).

The following table details the three high-level Business Value Contributors and how they are quantified and analyzed to assess the value contribution of a particular technology approach.

Business Value Contributors	Metric	Key Ingredients
Operational Costs	Fully loaded cost savings	Staffing and storage capacity utilization
Service Levels	Higher revenue or productivity from improved availability	Availability at the end user level
Business Flexibility	Higher revenue or productivity from faster application deployment	Rate of change to application environment

Each of these high-level value contributors contains numerous sub-elements and data points solicited from actual customer situations. These factors are assessed to develop an accurate view of current technology approaches (***The Base Case***) and compared to alternatives. The explicit intent of the model is to allow customers to compare tradeoffs of changes to the Base Case in business value terms. [All components of the model are quantified in value terms and represent real dollars - e.g. cost savings, revenue potential and/or productivity gains].

Keep it simple for customers. Boil value down to these three factors. Remember the key ingredients of each Value Contributor and focus the discussion on these factors.

How is the Model Applied to a Compaq SAN?

The tool quantifies and assesses the value contribution of the following storage topologies:

- ***Distributed*** – Physically de-centralized (outside of a data center), servers managed centrally, storage directly attached to servers and managed locally, backup over the corporate network.
- ***Collocated*** – Physically centralized (inside a data center), servers managed centrally, storage directly attached to servers and managed centrally (by IT Professionals), backup over a local network within the data center.
- ***Homogeneous SAN (SAN of Today)*** – Shared, pooled storage attached to multiple Compaq servers running a homogeneous operating system using Compaq storage. Any-to-any connectivity between servers and I/O (disk and tape) using a common serial switched fabric and network switches; static allocation of server and I/O resources.
- ***Limited Heterogeneous SAN (SAN of 2000)*** – Shared, pooled storage attached to multiple Compaq and non-Compaq servers running Unix (some flavors) and/or NT operating systems using Compaq storage. Any-to-any connectivity between servers and I/O (disk and tape) using a common serial switched fabric and network switches; static allocation of server and I/O resources with improved management function.

- ***Future SAN (SAN of 2002)*** - Shared, pooled storage attached to multiple Compaq and non-Compaq servers running multiple operating systems using multiple vendors' storage devices. Single point of control for dynamic allocation of server and I/O resources to optimize service levels and availability. Unified SAN OS or Global OS support.

Remember that most customers are going to have some mix of distributed and collocated storage. Typically IT Professionals have a much better handle on the storage that is inside the data center (i.e. collocated) and much of the discussion will center on this class of storage. A Compaq SAN solution will fare quite well (value-wise) relative to Distributed and Collocated storage so these will be your "Sweet Spots."

Customers will often also have some EMC-like storage connected to their Open Systems. This is often referred to as "Consolidated." The value proposition of a Compaq SAN (of today) has many similarities to an EMC (or Hitachi) consolidated approach (e.g. the benefits of shared storage pools across more than two servers) and you should position SAN as "the great equalizer." While there are many differences in the two approaches, the most important point is that **you no longer have to search exclusively for distributed or collocated opportunities. You can now effectively compete for pooled storage deals with EMC and Hitachi.**

Stage IV: Apply the Model to a Customer Environment

Typical Customer Storage Environments

In an ITcentrix survey completed in September 1999, we asked large and medium-sized customers "What is your single biggest storage problem?" The following table shows the responses:

Q42a. What is your biggest storage problem today?

	Frequency	Percent	Valid Percent
Backup window problems	79	26.3	26.3
Difficulty managing growth	66	22.0	22.0
Performance	24	8.0	8.0
Load balancing is difficult	14	4.7	4.7
Data availability	5	1.7	1.7
Lack of an enterprise storage strategy	4	1.3	1.3
Reconfiguration is difficult	4	1.3	1.3
Scalability	4	1.3	1.3
Recovery	3	1.0	1.0
Can't find or retain staff	2	.7	.7
Service levels	2	.7	.7
Storage is underutilized	1	.3	.3
Security	1	.3	.3
Other 1	91	30.3	30.3
Total	300	100.0	100.0

Note: Other includes "no problems" and items that comprise less than 5% of the total responses each.

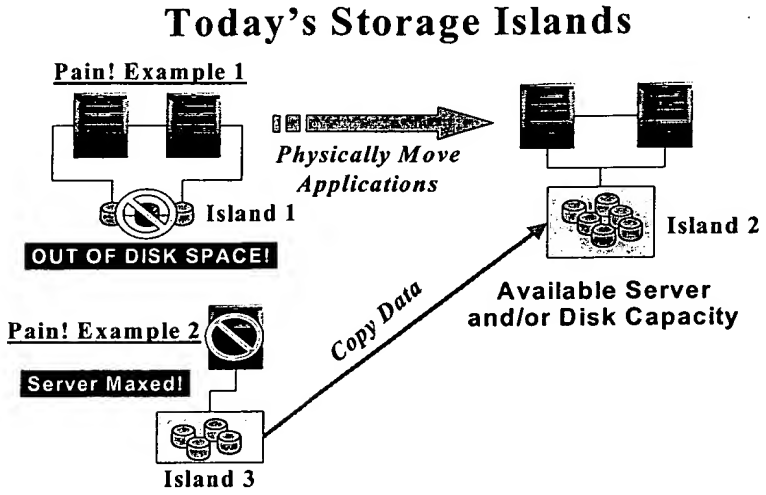
The survey shows that by far the two biggest customer issues are:

- Backup Window
- Difficulty Managing Growth.

The backup window problem is fairly straightforward in that customers frequently have many backup procedures for different types of server and storage platforms. This creates inefficiencies and elongates backup times. The goal of many customers is to reduce the number of procedures and increase the commonality in backup approaches.

Backup window problems have fairly significant business implications. Consider that backup window problems frequently cause so-called "Batch" overruns (i.e. system maintenance creeping into business operation hours). Batch overruns can cause unplanned downtime and cost hard dollars. In turn, many companies will forego a backup if it eats into normal business operations. This approach exposes a company to increased risk.

"Difficulty managing growth" is a bit more complicated. The following example demonstrates typical customer issues with managing growth:



The example is drawn from real world case studies and involves collocated storage (separate storage islands) in two scenarios:

1.) An out of disk space problem.

2.) The server is running at or above acceptable threshold levels.

In each case, customers have three unappealing choices:

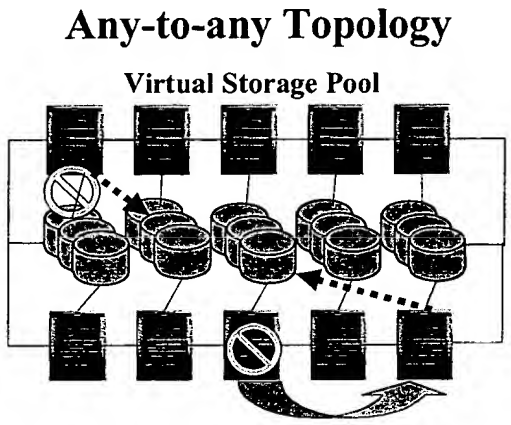
1. Buy more disk capacity
2. Physically move the applications (or re-cable the systems) to a location with additional capacity
3. Copy data over an already clogged corporate network to a location with additional capacity

Either the customer is buying storage when free space exists somewhere on the floor or the customer is forced to re-configure systems (at 3AM on July 4th). In either case, inefficiencies mount.

How SAN Addresses the Problems

SAN directly solves these issues cited above. In the case of backup window problems, by using a pooled storage approach. Common software and backup procedures can be implemented thereby dramatically simplifying the backup process and reducing pressures on backup windows.

As it relates to managing growth, consider the following depiction of an any-to-any topology:



In the example, if a disk or server reaches capacity limits, the SAN topology allows the system to redirect access to data (today manually and in the future dynamically).

Business Impacts:

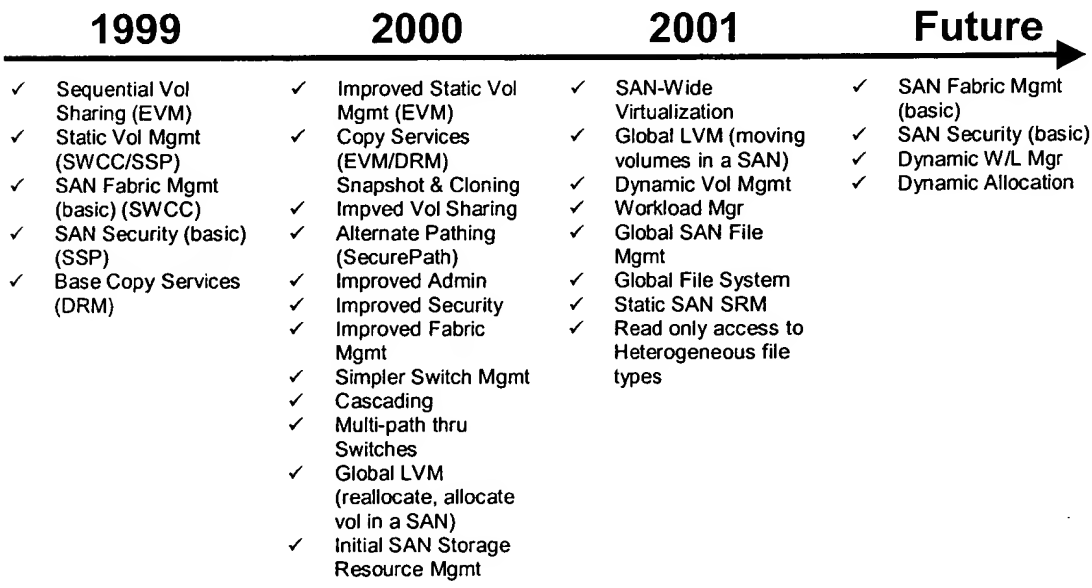
1. Simplified Operations
   A. Shared pooling
   B. Better capacity utilization
2. Improved Availability
   A. Balanced systems
   B. Fewer room for mistakes
   C. Enables automation (future)
3. Faster Time-to-market
   A. Direct access to data
   B. Easier application development and deployment
   C. Bronchitis

Think about what a customer with 50 or 100 or 200+ servers is facing. Typically, most of the servers will have attached storage that is not accessible by any other server. The above examples of "out of disk space" or "server is maxed out" probably occur quite frequently. While SANs don't totally eliminate these problems (because the customer will still be creating so-called "Cloudlets" with multiple SANs) they are a major step toward a single logical view of storage" and will have major business impacts.

Value of SAN by Functional Improvements

The ITcentrix Value Model quantifies the benefits of an any-to-any (any I/O to any server) SAN topology. Specifically, through extensive case studies with major corporations we assess the value of a SAN infrastructure and its "functional timeline." By functional timeline, we refer to the following Compaq SAN software roadmap:

Compaq SAN Timeline



Stage V: Agree on an Action Plan

Action Plan List

Gain agreement to apply the model to the customer IT infrastructure and present an analysis of the results. This analysis can be included as a "value section" in a formal proposal. The Action Plan should be designed to:

- Engage customer organizations in discussion of SAN value.
- Support customer decision-making.
- Expose tradeoffs of current storage infrastructure and against alternatives.
- Examine the benefits of a Compaq SAN in business value terms.
- Assess SAN applicability to the specific customer's environment.
- Provide direct inputs to customer business cases.

Using the Value Software Tool: Six Steps

Module 3

Purpose

The purpose of this module is to provide the storage specialists and sales representatives with an overview of the software tool and the six steps necessary for its effective use.

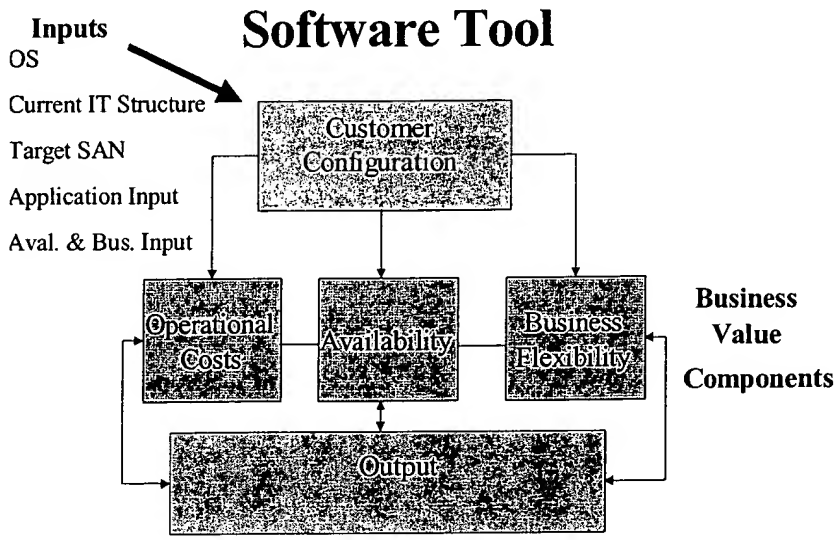
What's in this Module?

The following sections are included in this module.

A Conceptual View of the Software Tool

The Software Tool works by inputting specific data, which generates a value associated with the three main components of the model; Operational Cost, Service Levels (Availability) and Business Flexibility based on a given customer scenario.

The following diagrams provide a structural view of the software tool.



The Software Tool uses inputs from seven screens in the tool including:

- Company Information – Includes basic background reference points
- Current IT Infrastructure – Establishes current server, OS and storage installation
- Staff Input – Helps assess the storage capacity managed per person
- Target SAN Infrastructure – Identifies the SAN opportunity and scale
- Application Input – Focuses on the application(s) environment
- Calculating Application Value
- Availability and Business Flexibility – Applying the customer's application value to derive a customized value for higher availability and business flexibility

In addition, the software contains seven other screens; two summary screens and five screens of outputs. These screens can be used in proposals as appropriate and include:

- Input Summary: A summary of the input provided in the previous screens
- Assumptions - that the model uses that are not changeable by the user
- Compaq SAN Value $: A chart showing the four year absolute dollar value of a Compaq SAN broken down by storage topology (Collocated, SAN of Today, etc.) and value component (Cost, Availability, Flexibility).
- Compaq SAN Value %: A chart showing the percentage dollar value of a Compaq SAN broken down by storage topology (Collocated, SAN of Today, etc.) and value component (Cost, Availability, Flexibility).
- Staff Efficiency by Environment: A chart showing the customer's disk capacity managed per person – GB Managed Per Person (today) compared to projections if using a Compaq SAN.

- Availability Assumptions: A chart showing the availability assumptions used in the model. The chart shows: 1) Availability during normal business operations and 2) Scheduled downtime. Availability figures shown are end-user availability data.
- Components of Cost: A chart detailing the absolute four year dollar costs for the major factors of cost including: Server and software, disk and storage software, tape device, backup network, switch, server staff and storage staff costs. All costs are fully loaded and depreciated on a four-year schedule.

What follows is a description of the major steps involved in using the software. Each step may involve more than one screen in the tool.

Step 1: Assessing IT Infrastructure

Chances are that in each sales situation this is information you're already capturing. The step presumes you are interfacing with an individual that is an IT Professional with substantial knowledge of the customer's overall business, its IT installation, applications, storage specifics and overall IT direction. The step involves two input screens including:

- Screen 1: Basic company background information (revenue, # of employees, etc.).
- Screen 2: Information about the company's current IT infrastructure; with an emphasis on the types of servers and storage attached.

For the purposes of populating the tool, use the following parameters:

- Focus on storage that is under the management of IT Professionals.
- While the model doesn't exclude any platform...focus on the NT and Unix opportunity. Note: The model currently requires a separate analysis for the customer's Unix and NT storage infrastructures.
- Pick a Data Center (or centers) with which the individual has "adequate" familiarity.
- Expect that no one individual is going to have all the answers.
- Expect to get agreement to follow up with other individuals in the organization to "fill in the blanks."

Remember that The Model is as much a process as it is a "value generator." Your goal is to begin to develop a credible view of the

organization. If possible (and if time permits) you can capture input from multiple constituencies to strengthen your knowledge and business case. The process and model give you good justification to interface with Application Development Professionals, Line-of-business Managers and Senior IT Managers.

The typical approach to assessing a customer's IT infrastructure is to ask a series of questions that normally any customer can answer (at least generally) such as:

1.) Can you start by telling me about your IT infrastructure?

2.) How many servers and what types of servers (vendors and OS) do you have?

3.) Are the servers all in a centralized location?

A.)How many centralized locations and types of servers in each?

4.) How is the storage attached to these servers?

A.)Server specific (i.e. non-pooled)

B.) Pooled or Consolidated (i.e. multiple servers connected to a group of storage)

5.) How much storage (usable GB) is in each "group" (where a group is a set of storage attached to some N # of servers).

If the customer doesn't know the storage capacity...suggest that typically you see Unix servers with an average of **80-100GB** per system and NT servers with an average of **20-30GB** each. Ask the customer if this sounds about right for their situation.

Step 2: Assessing Operational Cost

This section is designed to ascertain details relevant to the Operational Costs Module. The module closely approximates a Total Cost of Ownership (TCO) analysis by including staff costs. The module is designed to be able to accept inputs from other TCO models and should be used in conjunction with such tools.

Start this section by explaining to the customer that the model uses inputs from the previous set of questions and makes certain assumptions about the customer's use of IT. Stress that any input of the model can be changed to reflect the customer's specific situation, but in the interest of time it might be wise to simply use some of the "defaults" for the first pass. You can always go back and further refine the model's inputs.

By far, the most important aspect of the Operational Cost Assessment is STAFFING. We've found this is the area that the customer typically underestimates in terms of cost impacts. By helping the customer uncover hidden staffing costs you can add significant perspective and value.

Inputs 3a and 3b on the STAFF INPUT screen are used to calculate your customer's GB's managed per person data (shown in the box on screen). You can compare this figure to industry averages by **REFERENCING THE CHART BELOW.**

Start by asking a series of questions related to staff including:

1.) For the Servers and Storage that we discussed previously, how many IT staff members (get full time equivalents) do you have looking after those resources? What is the total IT Staff?

Help the customer sort out the types of staff with the following potential "hit list."

* System Administrators
* Operations
* Database Administrators
* Applications Professionals
    -Applications Support
    -Applications Development
    -Applications Deployment
* Management

2.) What percent of their time is spent doing Storage-related activities?

Nine out of ten times the answer will be "not much" or **"less than 10%."** Your job is to "tease out" the real costs here. If done properly, the customer will often acknowledge that **25 – 55%** of staff time is spent managing storage. To get the customer thinking about hidden costs, go back to the above list and begin to assign storage-related tasks as follows:

* Backup (operators) * Data Placement (DBAs) * Recovery (Apps)
* Restore (systems) * Implementation (systems) * Data Integrity (Apps)
* Tuning (systems/DBAs)* Administration (systems)* Finding Data (Apps)
* Design (systems) * Acquisition (management) * Finding Capacity (Apps)
* Security (DBAs) * Disaster recovery (systems)

Note: These tasks will never be a perfect match with these titles so be flexible. Make sure Management Time is included as applied to the amount of time managers spend managing storage professionals.

During this process, prompt the customer with questions such as:

- Who handles backups?
- What about restore (the most important part of a backup)?
- What happens when you run out of disk space?
- How often do you have to recover from a failure or error?
- When you add an application, is it hard to find available server and storage capacity?
- Who handles this task?
- Is it common that when you add an application you never know how much storage you need until the application is ready to be deployed?

Write down the % of time spent on each task and add up the totals for each job function. Keep good enough track to refer to your notes after the meeting as this data will prove valuable. You'll also find that it's worthwhile to go directly to specific staff members and get their feedback. In particular, it's often the case that a Systems Professional will underestimate the storage impact to an Application Development Professional.

At the end of the process you'll have a good enough picture to do some rough calculations. Take the total number of TB's in the shop and divide by the Full Time Equivalent staff you've just calculated. You should see figures that roughly approximate the following table:

The Impact of Staff Costs

Topology	GB's Managed (Per Person)	~STAFF Costs (% of total storage costs)
Distributed:	150 - 200GB	60%
Collocated:	300 - 400GB	40%
SAN of Today:	500-700GB	30%
SAN of 2000:	1200-1500GB	15%
Future SAN:	2500GB+	10%

* Source: ITcentrix 1999

This chart shows (by storage approach) the total disk gigabytes that can be managed by an individual (on average). The right column shows the percent of total storage costs (storage TCO) that is attributed to **STAFFING.**

Remember that you've just assessed an entire IT infrastructure so you'll have a mix of different types of storage (often including so-called Consolidated). Our estimate is that typical Consolidated metrics (of today) closely approximate SAN of 2000 at around 1600GB per person. The key is to focus the customer on the opportunity to improve by using a Compaq SAN approach. This means pinpointing the SAN candidates within the Collocated and Distributed environments.

Caveats:

Your customer's information will not always match these numbers

Possible explanations include:

Lack of information.

Heavy use of Clustered Systems (which approximate the benefits of SAN).

Very poor storage Capacity Utilization.

Frequently customers will demonstrate better than expected capacity management efficiency (GB's managed per person) due to very poor storage

utilization. Typically, storage capacity utilization on so-called open systems is between **40 to 50%.** In an instance where management efficiency is better than expected storage capacity utilization can drop to as low as **20%.**

Step 3: Assessing the Target SAN Infrastructure

This step uses a single screen in the tool and requires the input from five questions related to the target SAN infrastructure; including:

- # of servers in the SAN (excluding failover servers).
- Price per server (including software and maintenance). Note: The tool uses a fully loaded 4-year depreciated cost which will often range between $20K - $50K for NT and $50K - $500K (and sometimes higher) for Unix.
- Usable/Formatted disk capacity of the target SAN.
- Type of disk technology used (18GB, 36GB, etc.).
- High availability (H/A) configuration (yes or no?). Note: If "yes" is selected, the tool appropriately doubles the number of servers and attached storage to create a "spare and spare" H/A configuration.

Unless, the customer plans to install a disaster tolerant solution such as Data Replication Manager, answer No to this question.

Note: Clarify for the customer that the model assumes a usable, protected price/MB assumptions of between **$.20 - $.40 per MB** (depreciated and including software) depending on storage topology.

Depending on the customer, sometimes it's better to not to address this level of detail unless asked to do so. Stress with the customer that you're happy to share all assumptions associated with the model but consider leaving such well-established information such as $/MB outside the initial assessment.

Step 4: Assessing Application Value

This step uses the input from two screens in the tool:

- Application Input
- Assessing Application Value

The Application Input Screen requires three inputs (5a, 5b and 5c). The first, 5a is simply a description of the application. The second two however, are vital for the creation of value and relate to the number of users accessing the application.

Start by asking two simple questions of the customer:

1.) What are the predominant applications running on these servers?

2.) How many total users are on these systems?

If the customer doesn't know...ask: "within a range...is it more than 10,000? Less than 10,000?" Try to narrow it down to a reasonable guess. **Typically, for Unix and NT servers, the number of users per server will range from 20-200. Use this "rule-of-thumb" to help the customer take a reasonable estimate.** If this doesn't help...narrow it down by focusing on the most important application (or applications). If this still doesn't work...take an action to follow up with someone that knows.

3.)What % of the users are active/concurrent?

The percentage of active/concurrent users is defined as the number of simultaneous users that are actively accessing the application at a typical point during normal business operations. The figure is meant to represent the average activity for the application during normal business hours.

This figure is crucial as it identifies those users on the system that are ACTIVELY CREATING BUSINESS VALUE BY USING IT.

The Calculating Application Value Screen provides key inputs to the ITcentrix Value Contribution Model. The process heavily relies on a proven technique used to establish the value of an application (or portfolio of applications) to the business. We use this value to calculate:

a.) The value of better availability

b.) The value of faster time-to-market

The basic logic of the concept is that if you have N number of active/concurrent users for an application, those users (in total) are the ones adding business value for the company. The value of that application (to the business) must equal at least the fully loaded costs of the users of that application (or else why bother installing the application).

As such, the base value of a target SAN application is established by taking the N active/concurrent users of the application times their fully loaded costs.

The slider input (6a) is used to multiply this base value by a factor (to establish the true application value) by "uplifting" the base value (just calculated). We have included some representative applications and their respective multipliers as reference but all situations will vary.

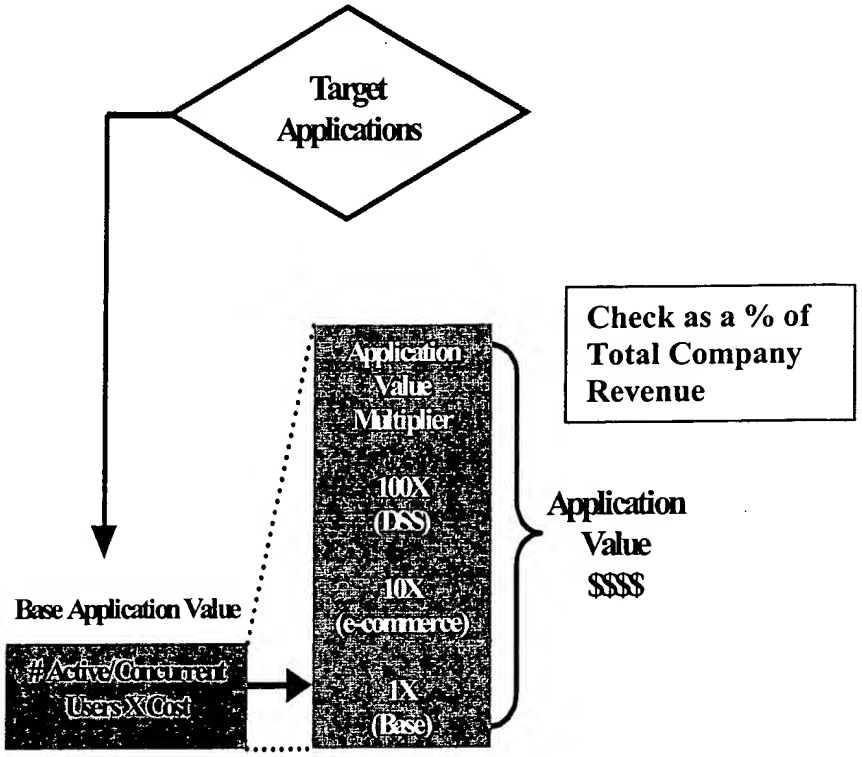
The box includes some "sanity checks" that can be used; specifically: 1) Application value as a percentage of the company's revenue and 2) Application value per active user (which can be compared to revenue per employee).

What follows is the details behind our calculations:

To establish Application Value:

- Take the number of active/concurrent users for a specific application (or set of applications).
- Multiply this number by the fully loaded costs per active/concurrent user (we use **$50,000** in the tool currently).
- The result establishes is the ***"Base Application Value."***
- "Uplift" the base application value by an ***"Application Value Multiplier"*** that reasonably reflects the total application value to the business (6a).
- Check this figure as a percentage of total company revenue.
- Check this figure on a per active user basis as compared to revenue per employee.

Calculating Application Value



Application Value Multiplier

EXAMPLE – Typical Customer Interaction

Q. For these target SAN applications, what would you estimate to be the ANNUAL value of these applications to the business?

A. That's a tough one…I really don't know.

- Well, you said there will be about 5,000 total users on the system right?

A. Give or take…that's right.

- And we estimated that about 15-20% of those were active/concurrent users right?

A. Right.

- Ok...let's use 15% so that's about 750 active/concurrent users okay?

A. Yes.

- Now, what we do is we assume a fully loaded cost per user. What would you say that is?

A. Oh...I don't know.

- How about $50,000 per user?

A. Sounds low.

- Okay, but let's be conservative and use $50,000/user okay? Cause sometimes these types of users are not too expensive...

A. Right...Okay.

- Okay. So 750 users times $50,000 = $37.5M...Okay...are you following this?

A. Yes.

- Alright...so what we've just done is set a ***Base Application Value*** by taking the # of active concurrent users times their costs. In other words...the application must deliver at least the base application value to the business or else why bother? Make sense?

A. Yes, of course.

- Now what we do is begin to multiply the Base Application Value by some factor to reflect the real application value. We typically see financial applications with a relatively smaller multiplier (3X or so) and commerce applications much higher (10X or so). What do you think for these applications?

A. Well, they're pretty much back office stuff so I'd say 2-3X.

- 2-3X...okay so that's between $75 to $100M. Sound about right.

A. Yes, I guess so.

- Well, what's your company's annual revenue.

A. It was around $2B last year.

- Okay, well we're saying these applications contribute roughly 5% to the company's top line...sound reasonable?

A. Yes. 5% sounds about right...I mean they're back office but it's stuff like getting our suppliers and partners paid so it relates to the quality of our company...Sure 5%...I can buy that. That's a pretty good way to look at it...It's maybe even a bit higher than that...

Step 5: Applying Application Value to Availability

One established, it's a fairly straightforward exercise to apply Application Value to Availability. As you may recall from the description of the Availability Module we use a number of factors to assess the impact of improved availability. For the purposes of populating the model, however we, for the most part, use "default values" based on discussions with large and medium-sized customers.

For example, we assume the following assumptions abut Application Availability during normal operations:

Application Availability Assumptions
(Availability During Business Operations)

Topology	Unix and NT Basic Configs	Unix and NT H/A Configs
Distributed	94.5%	97.3%
Collocated	94.8%	97.4%
SAN of Today	95.3%	97.6%
SAN of 2000	95.5%	97.9%
SAN of 2002	97.4%	98.7%

H/A = High Availability configuration which doubles the # of servers and storage devices.

We have also made a number of assumptions regarding factors such as scheduled downtime and % of business lost during scheduled downtime. Both have relatively minor impacts on the overall value figures.

Note: Many customers will have varying views of availability. Frequently, customers will refer to much higher availability figures but it is likely that they are not measuring availability at the application (or end user) level.

There's not much point in debating availability figures as they have a fairly small impact on the model overall. It's an important topic nonetheless and one that deserves attention. In addition, it's worth noting that the higher the application value, the greater the impact of improved availability on overall value.

The key to populating the Availability Module is answering the following question:

1.) **What % of revenue (or productivity) is lost during unplanned downtime?**

Low impact applications tend to see an impact of **5%** or less and high impact outages tend to **exceed 15%**. The key here is not the percentage, but the conversation that can ensue. Some sample questions follow:

Ancillary Questions:

2.) How mission critical are these applications?

3.) What's the impact of an unplanned outage?

4.) What do people do when the application goes down?

5.) What's their reaction?

6.) Can they transact business in other ways?

7.) Do they do nothing?

8.) Do they go home?

9.) What happens to the business?

Use slide bar to calculate impact of % of revenue or productivity that is currently lost during unplanned downtime for the Target SAN.

Step 6: Applying Application Value to Flexibility

As applications are enhanced through changes, business value is added. Application changes may make applications easier to use, faster, more functional, etc. As such, application changes usually mean added business value. The rate, at which changes can be made, therefore has a large impact on business value.

The tool asks the user to input the rate of application change in the environment ranging from Low to Medium to High. A low rate of change means the application is infrequently touched and has a very long useful life (e.g. more than 10 years). Payroll or many similar "back office" applications fall into this category. A high rate of change means the application undergoes significant change and has a shorter useful life (e.g. less than 5 years). Customer management applications or commerce-related activities might fall into this category.

The Business Flexibility Module uses information derived from the Application Value and calculates the value of improved business flexibility. The metric used is increased revenue or productivity from faster application development and deployment (faster time-to-market). For this version of the model, the inputs for the Business Flexibility Module are defaults based on conversations with customers. For the purposes of disclosure and discussion, the following questions can be explored:

1.) How frequently do you enhance existing applications?

2.) By roughly what % each year do you increase the number of users supported for (a specific or set of specific) this application(s).

3.) How many new applications do you deploy each year?

4.) Would having direct access to data help your applications group accelerate development?

5.) Would having an any-to-any topology between servers and I/O accelerate application development and deployment by simplifying space allocation and re-allocation?

6.) If you had direct access to data and could automatically allocate space, by what % do you think you could improve application development and deployment? 1%? 5%? 10%?

Step 7: Delivering Results

By this point hopefully you've established with the customer that you are genuinely interested in establishing business value for the customer. Some typical action items from this meeting might be:

1.) Follow up with other individuals to fine tune data. Examples might include:
   A. Applications Professionals to identify storage problems
   B. Someone who knows Staffing
   C. An individual who has responsibility for Distributed Storage
   D. Someone that might help clarify the Storage Capacity Utilization
   E. A Line-of-business Professional that could help clarify Application Value
2.) An offer to run the Value Model and share the results with the customer.

I will provide Graphic

Outputs such as this can be pasted into proposals with other supporting documentation. The proposal could contain a Value Section that describes how a Compaq SAN delivers business value. Importantly, the models will be generated using customer-supplied data with a fairly good understanding of assumptions used in the calculations.

Reference: Appendix E Science of Selling- Letter of Understanding

Case Studies
Module 4

Purpose

What's in this Module?

The following steps are included in this module.

Appendix

Assumptions

The charts contained in the output screens have taken customer supplied information, combined with industry average data from ITcentrix surveys, and assigned values for three areas:

- Dollars from cost savings
- Dollars from higher availability
- Dollars from faster application deployment

These values are derived by overlaying key technical features of SAN (e.g. Global Naming) and assigning value contributions to them (in each of the above areas). The assignment of these values comes from detailed surveys with customers (who have SAN or equivalent technology installed). In the case of future technologies, the values are derived by probing hypothetical scenarios with customers about what impact specific features will have on their operations.

The following chart shows a summary of each function from the SAN timeline, to which topology it applies and the business impact in Cost, Availability and Flexibility terms. The model weights each of these functions and applies them accordingly to each storage topology in terms of their value contribution to the business.

Function	Topology	Cost Savings	Availability	Flexibility
Collocation	Collocated	High	Medium	Low
Sequential Volume Sharing	SAN of Today	Very High	None	Medium
Point-in-time Copy	SAN of Today	Medium	None	Medium
Alternate Pathing	SAN of Today	Low	None	Low
Fibre I/O Cards	SAN of Today	Negative	None	None
Static Volume Management	SAN of Today	Medium	None	Medium
Improved Static Volume Management	SAN of 2000	Low	None	Medium
Sequential Volume Sharing	SAN of 2000	Low	None	Medium
Fibre I/O Cards	SAN of 2000	None	Negative	None
Fibre I/O Cards with Logical Port Names	Future SAN	Very Low	Negative	None
Logical Port Names	Future SAN	Very Low	Medium	Low
Dynamic Volume Mangement	Future SAN	High	High	High
Dynamic Storage Allocation	Future SAN	High	None	High
Read-only access to Heterogenous Files Types	Future SAN	None	Medium	Medium
Global SAN File Management	Future SAN	High	High	High
Workload Manager	Future SAN	Medium	High	Medium
Dynamic Workload Manager	Future SAN	Medium	High	High

The following general assertions apply for each area of value:

Operational Costs:

SAN cost benefits stem primarily from the following areas:

- Significant reduction in storage management complexity.
- Reduced number of processes and procedures.
- Easier/faster problem determination and resolution.
- Automation of copy procedures.
- Simplified backup and restore.
- Significant reduction in performance management.
- Easier resolution of bottlenecks due to improved I/O pathing.
- Faster recovery process for system administrators.

Availability:

As storage topologies advance, availability improvements are primarily due to the following factors:

- Faster recovery times for hardware and software errors.
- Fewer operator errors (due to simplified IT).
- Better recovery procedures (again, simplified IT).
- Reduced backup window pressures.
- Lower probability of offline procedure (batch) overruns.
- Ability to manually balance workloads across more volumes and servers to avoid dangerously high server and storage utilization levels.
- Automated any-to-any exploitation results in significant reduction of errors related to server and storage resource constraints (Future SAN).

Business Flexibility:

As SANs are enabled, the impact on applications development and deployment can be substantial. SANs address the following storage issues:

- Applications development has better (more direct, any-to-any) access to existing data sources within the organization.
- The data for applications can be more easily (directly) extracted from existing information.
- The data required for applications can be more easily moved and exploited by other applications.
- System configuration constraints are less problematic as applications gain more dynamic access to storage and server resources.
- On balance, better data access means faster changes and simpler change management.

Glossary Terms

Business Value Contributors –

Operational Costs

- Fully loaded cost savings including factors such as staff efficiencies, hardware utilization, network costs and software costs.

Service Levels

– Incremental revenue or productivity dollars from higher availability due to reduced planned downtime, reduced unplanned downtime and improved performance (future).

Business Flexibility

– Incremental revenue or productivity dollars from faster application deployment due to reduced time to develop and introduce new applications (i.e., time-to-market) and value generated from faster deployment times.

Distributed Storage

– Physically de-centralized (outside of a data center), servers managed centrally, storage directly attached to servers and managed locally, back up over the corporate network.

Collocated Storage

– Physically centralized (inside a data center), servers managed centrally, storage directly attached to servers and managed centrally (by IT Professionals), backup over a local network within the data center.

Homogeneous SAN *(San of Today)*

– Shared, pooled storage attached to multiple Compaq servers running a homogeneous operating systerm using Compaq Storage. Any-to-any connectivity between servers and I/O (disk and tape) using a common serial switched fabric and network switches; static allocation of server and I/O resources.

Limited Heterogeneous SAN *(SAN of 2000)*

– Shared, pooled storage attached to multiple Compaq and non-Compaq servers running Unix (some flavors) and/or NT operating systerms using Compaq Storage. Any-to-any connectivity between servers and I/o (disk and tape) using a common serial switched fabric and network switches; static allocation of server and I/O resources with improved management function.

Future SAN (San of 2002)

– Shared, pooled storage attached to multiple Compaq and non Compaq servers running multiple operating systems using multiple vendors' storage devices. Single point of control for dynamic allocation of server and I/O resources to optimize service levels and availability. Unified SAN OS or Global OS support.

Storage Area Network (SAN)

– an approach to system and storage management that enables an any-to-any fibre channel connection topology where any server (in theory_ has access to any connected storage (including tape) across at least three OS images.

Click here for more pages about ""New World Data Center" + ITCentrix + Ziff".

ZD Studios' New World Network Conf Series Addresses the Changing Role C Data Center New World Data Center Conference Offers a No-Nonsense Ser IT Decision Makers to Transform The Centers for Increased e Business V

25 Aug 1999

NEEDHAM, Mass., Aug. 25/PRNewswire/NEWSdesk/ -- Ziff-Davis announce World Data Center Conference, an invaluable two-day conference designed to l increase their companies' business value by dramatically improving service lev market. With the advent of the Internet and the growth of e-commerce, the rol has changed from focusing on reducing operational costs to increasing busines This critical IT conference will be held October 4 -- 5, 1999 at the Boston Park Boston, Massachusetts.

"The growth of the Internet has put tremendous pressure on businesses to cha said Kim Myhre, vice president, ZD Studios. "The Web has become the new pla companies must compete. As a result, many organizations are now re-focusing create a 'new world' data center that will support the need of e-commerce. Trac models must now be transformed into Web-enabled communications and tran are focused on interacting with customers. The New World Data Center Confer designed to help IT organizations make this transformation to increase e-busir

The New World Data Center, the fifth offering in ZD Studio's New World Netw series, will bring together leading IT experts to share their insights, and provid practical methodologies to support data center transformation. Attendees to th

Center Conference will hear first hand how to:

-- Harness the power of the Internet -- Create new IT business value -- Reduce revenue-generating applications -- Leverage emerging outsourcing services -- I satisfaction

Industry experts will also be on hand to share their perspectives on how integr their companies overall success. Keynote addresses will be presented by:

-- Selby Wellman, senior vice president, Cisco Systems, Inc. -- Douglas Mow, v Internet multi-media marketing, Qwest Communications Speakers for the Nev Conference include: -- Susan Almeida, co-founder & managing partner, Netwo LLC -- Jay Bretzman, netfinity strategy & market segment manager, IBM Corp Burstyn, director, telecommunications industries, International Data Corporat Flanagan, vice president, The Cordis Group -- David Floyer, founder & vice pre ITcentrix -- Aaron Goldberg, executive vice president, ZD Market Intelligence - director/technical resources, Widener University -- David Hill, senior analyst/ management, Aberdeen Group -- Brian Jeffery, managing director, Internatior -- Paul Johnston, director/strategic marketing, Cambridge Technology Partner Kaplan, director/strategic marketing, International Network Services -- John I McConnell Associates -- James Metzler, Ph.D., president, The Metzler Group - president/network business practice, Renaissance Worldwide -- David Mosche senior researcher, Computerworld -- Art Petrella, network architect, Rosenblut David P. Vellante, president, ITcentrix

Cisco Systems, Inc., IBM and Qwest Communications are sponsors of the New

The New World Networks Conference series was developed by ZD Studios and conjunction with, ITcentrix, Interop, Inter@ctive Week and ZD Net. The Series end-users, service providers, equipment vendors and content generators mana opportunities presented by the transition form traditional voice-driven circuit- data intensive packet-switched networks.

For registration or additional information, contact Stacye Montez at 650-578-(stacye_montez@zd.com . For more Conference information visit http://www.i

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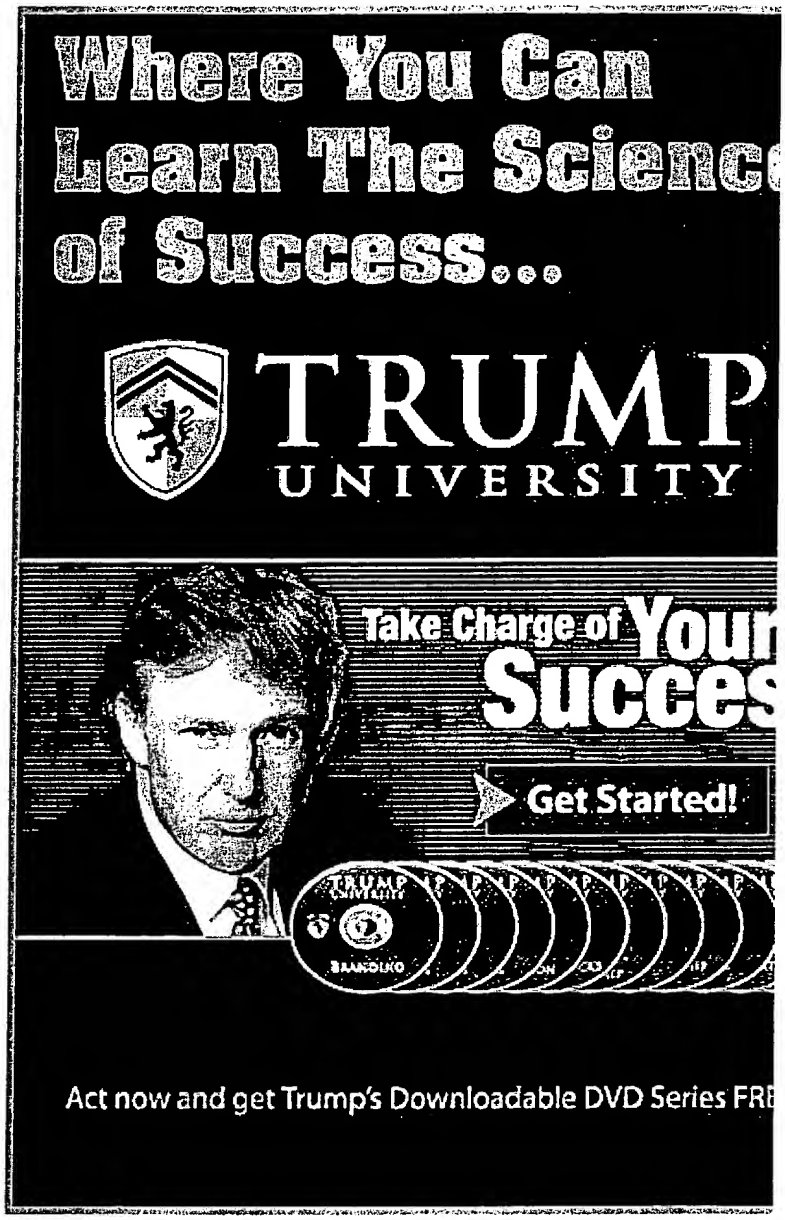

As a division of ZD Events, ZD Studios is dedicated to creating custom marketi marketers in addition to some of the most attended, and highly regarded confe in the industry. These face-to- face solutions are developed by a vast resource c who have access to the global resources of Ziff-Davis including publishing, evei Internet, television and education as well as the industry's most sought after ex makers, and celebrities. This flexibility, combined with a solid foundation of ex Studios as a leader in developing successful, creative, face-to-face marketing pı leading technology companies.

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Ziff-Davis Inc. is a leading integrated media and marketing company focused c Internet-related technology, with principal platforms in print publishing, trade

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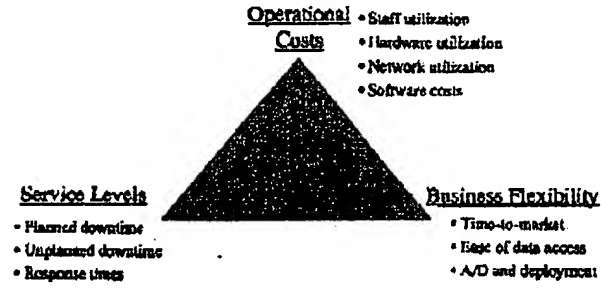
The ITcentrix Value Contribution Model

What is It and How Does it Work?

The ITcentrix Value Contribution Model (Figure 1) provides a strategic framework to assess IT's contribution to business value. It is based on a proprietary and tested methodology that combines cost, technology and business modeling to more accurately predict how changes in IT will impact business results. The data from the model are calibrated using real world case studies of Global 2000 corporations and other public and private sector institutions.

Figure 1
The ITcentrix Value
Contribution Model



The model bases assumptions on actual customer data and allows users to make changes to reflect specific applications and, planned downtime, network utilization, etc.).

Three high-level ***Business Value Contributors*** are quantified and analyzed to assess the value contribution of a particular technology approach:

- ***Operational Costs*** – [Metric: Cost Savings] - Emphasizing factors such as staff efficiencies, hardware utilization and network costs.
- ***Availability*** – [Metric: Incremental Revenue or Productivity Dollars] - Emphasizing application availability and costs associated with planned and unplanned downtime.
- ***Flexibility*** – [Metric: Incremental Revenue or Productivity Dollars] - Emphasizing the time to develop and introduce new applications (i.e. time-to-market) and the value generated from faster deployment times.

Each of these high-level value contributors contains numerous sub-elements and data points solicited from actual customer situations. These factors are assessed to develop an accurate view of current technology approaches (***The Base Case***) and compared to alternatives. The explicit intent of the model is to allow customers to compare tradeoffs of changes to the Base Case in business value terms. [All components of the model are quantified in value terms and represent real dollars - e.g. cost savings, revenue potential and/or productivity gains].

New World IT – Enabling e-business Value

Introduction

As an IT professional, what percent of your time is spent on issues that are internal to your organization versus external or customer-focused? Is there any doubt that over the next ten years the latter will predominate?

In the forty-plus year history of the IT business, companies have spent billions of dollars building IT infrastructures aimed at improving internal operations. In the past ten years alone, companies have enforced PC hardware and software standards, built internal network infrastructures, created help desk capabilities, made extensive use of advanced packaged software and developed credible application groups. Just when IT organizations thought they had it figured out – The Internet changed the rules.

Once viewed as state-of-the-art, client/server infrastructures are insufficient to meet the demands of today's businesses. To respond, companies must completely revolutionize their management approach and shift the emphasis of IT from one of an internally managed asset to a revenue-producing engine.

IT organizations face enormous pressure to create new transaction systems that integrate with legacy information to enable online buying, best-in-class customer service and seamless partner connections. And it has to be done quickly as time-to-market has become the most important competitive advantage.

A New World Nightmare

Consider the following real-world example of how a successful, established company has to completely re-engineer its strategy around IT.

For years, a major European publishing firm has enjoyed enormous success. Its properties were viewed as leading edge among consumers and business professionals alike. Its editors and writers were some of the most respected in the industry. Growth rates consistently exceeded 25% per annum and profitability, while sometimes under pressure during tough economic times, always rebounded to higher levels.

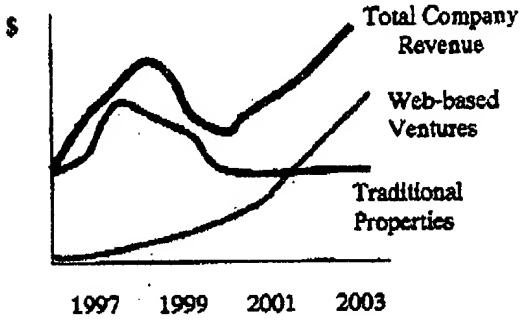
The company's board was conservative and steadfastly resisted the temptation to incur debt. It grew organically, the old fashion way. It also avoided turning to equity markets for funding. It preferred to maintain a private company atmosphere and use this to its advantage. The multibillion-dollar company had grown to over 4,000 employees worldwide and was on a roll.

Suddenly everything changed. Circulation for the major properties began to stall and advertising revenues flattened. As in rough economic times before, the company turns to drastic cost-cutting measures. The problem however, this time the economy is booming.

Webzines are popping up everywhere and sniping at the company's core franchise. These upstart competitors are able to launch new, Web-based publications, staff up with 50-60 writers and achieve huge circulation for one-third the cost. What's even more frustrating is that these companies are well-funded, growing rapidly, publicly traded and command enormous valuations. Even after the market corrects, and these new firms are trading at 30% of their all time highs, their valuations are 20-30 times revenues (versus 1X for traditional publishers).

Almost overnight, everything has changed. The company's revenue forecast resembles the following chart.

Figure 1: The Impact of the Web



Perhaps the picture doesn't look so bad. The company is telling its employees to hang in there, it is very well positioned. They have the advantage (despite what the market thinks). They have real profits and once the market reaches equilibrium everything will swing back in their favor. What's more, they can use their print publications to increase eyeballs on the Web. In theory, it sounds great.

Maybe so, but the market doesn't value paper anymore. The company is perceived as a "dead-tree" maker with a questionable future. The best employees are leaving and the company has lost all its momentum. Its community of readers is defecting to other Web-sites and the advertisers have begun to question the viability of many of the company's properties. Potential partners are looking elsewhere and a once long line of potential acquirers is refocusing targets and overpaying for pure play Web publishers.

The board looks to the outside world as if it's in a coma. It is torn between hanging on to the traditional print franchise and shifting the company's focus toward the Web. It doesn't want to lose what it took twenty years to build and at the same time it is losing altitude rapidly.

The problem and the solution are underscored by the company's IT strategy. Information technology has been a cost item at the firm, pushed out to the business units and focused almost solely on financial operations and internal productivity. Compared to its Web-based competitors, which are basically Web sites with home-based writers who have access to a Web browser, the company's infrastructure is too decentralized, too expensive and not focused on the right opportunities.

This scene is playing itself out across the globe and in case studies at business schools. Every company knows it has to change its IT strategy but all too often there's more talk than action. This position paper provides a starting point and call-to-action toward the development of a New World IT infrastructure that emphasizes e-business value. It presents the ten steps that need to be considered when transforming an existing infrastructure into a customer-facing IT approach. Importantly, the paper provides methodologies for quantifying the business value of IT that can be applied in strategic and tactical planning.

The goal of the paper is to help companies improve their time-to-market strategies with IT. While recognizing the need for operational excellence, the paper is advocates using information technologies and infrastructures to accelerate application development and deployment and generate tangible business value.

Building the New World Data Center – Ten Practical Steps

A major challenge facing companies today is how to leverage existing IT assets and re-orient them toward the customer to increase revenues, improve customer service and accelerate time-to-market. The task is complicated by several factors including Y2K fixes, staff shortages and inflexible IT infrastructures. Indeed, with the long list of technology distractions facing businesses today, combined with severe staff shortages, it's not surprising to see companies emphasize operational effectiveness and lower costs ahead of time-to-market.

To address these issues and better respond to customer demand, companies are developing what we refer to as The New World Data Center. The New World Data Center is a network-centric information center that puts the external customer first in the priority line. The New World Data Center centrally manages both internally and externally connected resources using the acceptance of IP as a catalyst for common communications across IT boundaries.

The New World Data Center is a competitive imperative. The options afforded by the New World Data Center dramatically improve the ability of IT Management to adapt to rapidly changing business environments and accelerate time-to-market.

ITcentrix has developed the following ten guidelines and corresponding self-probing questions toward developing New World IT; they include:

1. ***Know thy Business Model*** – (Do you understand why your company is or is not successful?)
2. ***Set Winning Goals*** – (When you value IT are you focused on the right attributes?)
3. ***Measure Honestly and Measure Often*** – (How do you measure value?)
4. ***Prioritize and Plan for Success*** – (Do you understand the business value of the applications being deployed at your company?)
5. ***Develop High-Impact Applications*** – (Are the applications your company is developing high impact?)

6. ***Design External Applications for Continuous Business*** – (Are your Web-based applications designed for continuous access?)
7. ***Manage Assets and Resources Proactively*** (Are you getting the most out of your hardware/software and people assets?)
8. ***Partner Sensibly and Simply*** – (Are you making the right choices?)
9. ***Rethink Make V. Buy Strategies*** – (Is outsourcing in your future?)
10. ***Design Flexibility into IT Infrastructures*** – (Can your IT infrastructure accommodate rapid and frequent change?)

What follows is a brief discussion of each issue with tips and tools to getting started.

Know thy Business Model

Business alignment has been the "war cry" of IT managements for years. Y2K notwithstanding, it is common for IT strategies to be "rear view mirror" oriented, responding to past business pressures and not proactively addressing current corporate objectives. It is not uncommon for executives to have unclear or diverging opinions of corporate strategy so chances are that IT professionals will often not have the most current view of the underlying business model of a company, especially when it is transitioning rapidly.

Consider the following points to aid in IT/business alignment:

- Understand your business model and how it will evolve.
- Research the competition and emerging business models.
- Know the end customers and evaluate their IT needs.
- Get plugged in to the corporate planning process.
- Participate in strategic decision-making.
- Tie incentives to supporting business objectives.
- Involve business management in setting IT priorities.

Take the following <u>Business Model</u> test: Business *and* IT professionals should be able to easily answer the following ten questions in less than two minutes:

1. What business are we in?
2. What do we sell?
3. Who are our customers?
4. How many customers do we have?
5. Who sells our products/services?
6. Customers buy our products/services because...
7. What is our main differentiator?
8. How (or when) do we make money?
9. Lower costs, better service or getting to market fastest which <u>one</u> is most important to our company and why?
10. What are our major constraints to growth and increased success?

Difficult IT tradeoffs are often made without the input of business management. The reverse situation is also common and IT professionals must be proactive about injecting themselves into the business planning and decision-making process. Being able to answer these simply questions quickly is a starting point.

Set Winning Goals

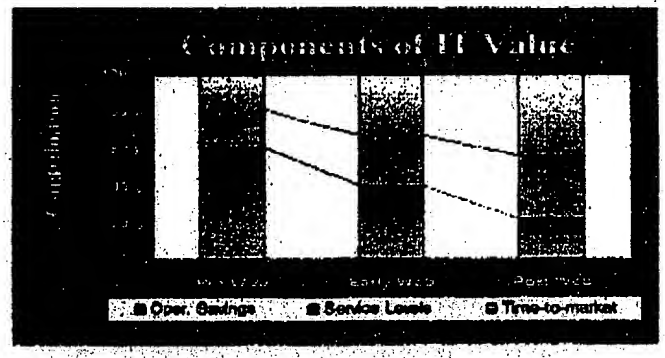
If you plan for mediocrity, chances are you'll succeed. Implementing the New World Data Center philosophy starts with a set of objectives that best meet an organization's overall direction. If corporate objectives are to attain a leadership position, then IT must, by definition, achieve best-in-class status. Some considerations include:

- Begin IT planning with external customer needs.
- Serve an order of magnitude increase in the number of connected clients.
- Accommodate extremely high and previously unforeseen levels of availability.
- Agree (with lines of business) on service level targets two years out—Aim high.
- Rapidly reduce cycle times for supporting new business initiatives.
- Increase IT's contribution to business success.
- Support Post-Web economics and new business models.
- Assign cross-functional teams to implement goals.

Importantly, specific targets need to be placed on each (or most) of these items so that measurements and incentives can be implemented.

What's missing from this list is anything to do with costs. Competitive operational costs are the ante in today's business environment and while companies should strive to simplify IT, it is only part of the equation.

Consider the following chart:



Based on extensive case studies with dozens of Global 2000 corporations and the application of extensive value analysis, ITcentrix research shows that the value contribution of IT is changing dramatically. Once derived primarily from operational

cost reductions, IT value increasingly is trending toward improvements in customer service levels and time-to-market improvements.

As the case study used at the beginning of this paper demonstrates, time-to-market improvements and customer service levels can make or break businesses. What would it have meant, for example, if Barnes and Noble were able to launch its Web site nine months earlier? What would it mean to your company if your Web-based business forecasts could be shifted to the left by several months?

Measure Honestly and Measure Often

Without measurements, there is no sound basis for further investment. IT should be approached in a fashion similar to any business initiative and open and honest measurements are compulsory. Chances are you will not get it right the first time so frequent measurements and adjustments will be necessary. The following points can serve as guidelines:

- Develop ways to measure the total value contribution of IT.
- Measure factors such as service levels and availability at the customer level. (What the customer doesn't see, doesn't exist).
- Measure customer satisfaction often and honestly (e.g. number of customer incidents as opposed to complaints).
- Benchmark against the leaders, not the average of all competitors.
- Benchmark leading companies outside of your industry but with similar economic models.

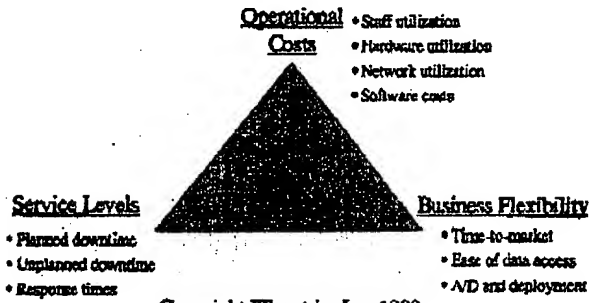
To adapt to these changes, companies are re-thinking the way they measure the value contribution of IT in order to evaluate outward-facing investments. IT has historically been measured in terms of cost savings and value contributors like service levels and time-to-market impacts have been relegated to the back burner.

The ITcentrix Value Contribution Model (see Figure) provides a strategic framework to assess IT's contribution in business value terms and specifically reflects the value of customer-facing IT. It is based on a proprietary and tested methodology that combines cost, technology and business modeling to more accurately predict how changes in IT will impact business results. The data from the model are calibrated using real world case studies of Global 2000 corporations and other public and private sector institutions from the following segments:

- Financial services
- Insurance companies
- Transportation companies
- Health care providers
- Large equipment manufacturers
- Pharmaceutical companies
- Telcos
- Retailers

- Distributors
- Internet Service Providers
- Consumer and industry-oriented Internet startups
- Government and educational institutions

The ITcentrix Value Contribution Model



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The model uses assumptions based on actual customer data and allows users to make changes to reflect specific applications and environments (e.g. application value, levels of availability, planned downtime, network utilization, workloads, etc).

Three high-level ***Business Value Contributors*** are quantified and analyzed to assess the value contribution of a particular technology approach:

- ***Operational Costs*** – [Metric: Cost Savings] - Emphasizing factors such as staff efficiencies, hardware utilization and network costs.
- ***Service Levels*** – [Metric: Incremental Revenue or Productivity Dollars] - Emphasizing application availability and performance and associated costs.
- ***Flexibility*** – [Metric: Incremental Revenue or Productivity Dollars] - Emphasizing the time to develop and introduce new applications (i.e. time-to-market) and the value generated from faster deployment times.

Each of these high-level value contributors contains numerous sub-elements and data points solicited from actual customer situations. These factors are assessed to develop an accurate view of current technology approaches (***The Base Case***) and compared to alternatives. The explicit intent of the model is to allow customers to compare tradeoffs of changes to the Base Case in business value terms. [All components of the model are quantified in value terms and represent real dollars - e.g. cost savings, revenue potential and/or productivity gains].

By analyzing changes to IT, we are able to more clearly understand the components of value. The model allows certain values to be

held constant (e.g. application response times) so that other factors can be assessed in a more in depth manner. This allows IT professionals to run "what ifs" and quantify tradeoffs (e.g. cost versus availability).

In today's fast-paced environment, an IT organization that develops a methodology around such a tool can help communicate IT imperatives in business terms. This in and of itself has value in terms of making more rapid decisions. More importantly, however, such an approach can bridge the gap so often seen between aggressive line of business professionals, with enormous time-to-market and competitive pressures, and the IT staff chartered with implementing leading edge solutions.

Prioritize and Plan for Success

Having established winning IT goals at a broad level and agreeing on the tools in the planning processes to measure the contribution of IT to the business, we now turn our attention to the priorities of the company. While well-understood planning principles involving the entire IT organization, with business input, are fundamental to this process. As always, buy-in and communication are the key ingredients.

What is different from typical planning processes, however is the business justification. Establishing clear and credible links to revenue generation, enlisting line-of-business advocates and communicating results in business terms are essential elements. We believe this process starts by evaluating the value of the applications being deployed and maintained.

What follows is a brief methodology to assess the value of the applications to the business. We start by asking ten basic questions about the applications (with a particular emphasis on strategic applications and those targeted for near-term development and deployment), including:

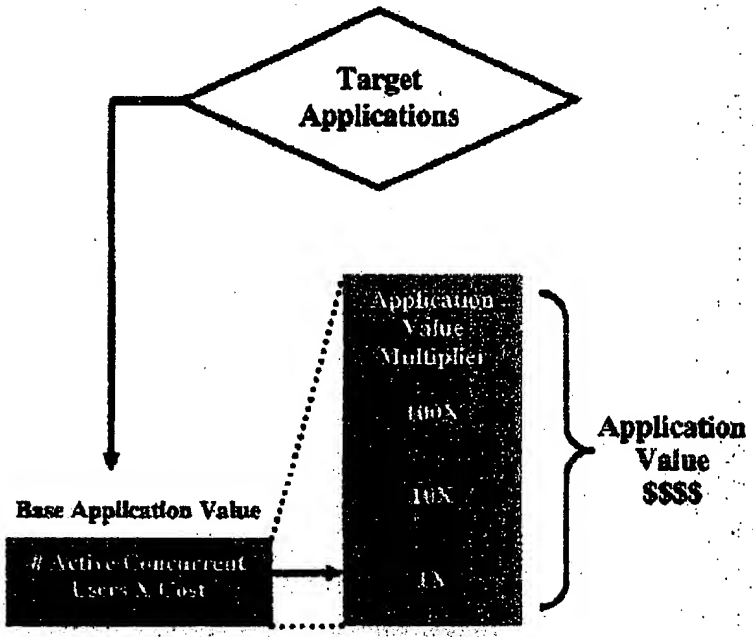
1. How can we best establish the value of our application portfolio?
2. Are the highest impact applications getting development and deployment priority?
3. How many users are/will be connected to these applications?
4. What percent of these users are/will be active and concurrent users on average?
5. What is the average cost of this user (fully loaded)?
6. What is the unplanned downtime (or expected unplanned downtime) for these applications in a given period of time (e.g. three months, one year, etc.).
7. How much business or productivity (as a percentage of the total) is/will be lost during unplanned downtime (assuming a typical length of application unavailability).
8. Is/will planned downtime causing lost business?
9. What percentage of overall company revenues are/will be comprised of these applications?
10. Is our IT infrastructure an inhibitor or enabler to application development and deployment?

Once these issues are explored, it is a fairly straightforward exercise to gain consensus on the value of the applications using the information collected. Importantly, the questions should be posed (at least in part) to both line of business professionals and customers impacted.

A simple methodology is to take the information developed above and begin to value the applications according to the following formula/process (see chart):

- Take the number of active/concurrent user for a specific application.
- Multiply this number by the fully loaded costs per active/concurrent user.
- The result establishes is the ***"Base Application Value."***
- "Uplift" the base application value by an ***"Application Value Multiplier"*** that reasonably reflects the total application value to the business.
- Check this figure as a percentage of overall company revenue.

Calculating Application Value



Keep in mind that the value of an application, will almost always be greater than 1X the Base Application Value (or what is the point of developing and deploying the application?). While there may sometimes be compliance or other extenuating circumstances, this rule of thumb should generally hold true.

Additionally, the Application Value Multiplier should vary dramatically by type of application. A financial application, for

example might only have a 2X or 3X multiplier whereas an e-commerce application should be significantly higher (10X or greater). A decision support application might only consist of a few active/concurrent users but because their decisions are so highly leveraged the multiplier might be as high as 100X.

Consider external users/customers in the equation where applicable and constantly compare the values as a percent of total company revenue for sanity checks.

Once established, this method can be used as a framework to prioritize application development and deployment priorities, assess the cost of downtime and measure the value of faster deployment and time-to-market improvements. It can also be used as a tool to assess how changes in IT infrastructure (which will impact costs, availability and time-to-market) add to business value.

Develop High-impact Applications

In July and August of this year, ITcentrix conducted a survey of 200 U.S. corporations running Unix and NT servers. We interviewed respondents in companies with over 5,000 employees across a wide range of industries. According to the survey, most corporations spend a vast majority of their resource maintaining and enhancing existing infrastructures. Despite the fanfare, frequently, a relatively small emphasis is placed on really high-leverage external, Web-based activities.

For respondents' Unix and/or NT platforms, we asked IT and Data Center Management Professionals to cite the single most important application running on their NT and/or Unix systems. The following table shows the results:

Most Important Unix and NT Applications

Most Important Application	*NT%*	*Unix%*
Email/Messaging	37	15
Decision Support	14	10
Financial/Accounting...	10	22
File & Print	10	7
Web/e-commerce Applications	6	8
Systems/NW Management	6	5
Application Development	3	5
Collaborative Apps	3	2
Technical/Scientific	2	10
ERP/ERM/Supply Chain	2	4
Personal Productivity	2	2
Other	5	10
N = 200 Respondents	100	100

While email and messaging were frequently cited in the survey, and these can often be considered external applications, it is noteworthy that pure Web-based and e-commerce applications were infrequently cited as the most important by these respondents.

While this is not exceedingly surprising, the data underscores the fact that most companies are merely in the early stages of Web-based development. This in and of itself presents a major challenge for established companies as they struggle to maintain existing infrastructures while at the same time capitalizing on Web-based opportunities (and defend against Web threats).

New World IT professionals should strive to spend 80% of their time on "the 10's," applications that produce significant e-business value. Importantly, this means optimizing applications for external value in addition to internal efficiency.

The importance of this effort cannot be overstated. History suggests that purely focused companies will have an impact on established players and cause meaningful discontinuities in the competitive structure of several markets. Despite talk of overvaluations, Internet bubbles and profitless enterprises, there is little doubt that today's Web-based entities are getting to market faster, adding significant value for customers and doing so with far less cost than most established firms. It would be unwise to bet against this trend wreaking major havoc on existing companies.

At the same time it is vital for established companies to maintain perspective. It is unrealistic to expect that 100% of the world's books will be sold online or that every stock trade will be handled over the Internet. In all likelihood, markets will eventually reach equilibrium phases and firms must strive to embrace change and accelerate their time-to-market.

The following points are worth considering when thinking about new applications:

- What companies do with IT is now more visible than ever.
- Expect orders of magnitude increases in customer volume, service requirements and change requests.
- Consider the business value of trading operational costs for better service levels and faster time to market and evaluate such a business case.
- Take advantage of bandwidth and community.
- Design for business continuity.

Design External Applications for Continuous Business

Companies are experiencing orders of magnitude increases in the number of connected customers and their corresponding application availability requirements. High availability and increasingly, disaster tolerance, once the domain of only a few select applications, is becoming more fundamental to business operations.

ITcentrix has developed a method for considering the business value of availability, and disaster tolerance. Typically viewed as an exceedingly expensive proposition, designing for business

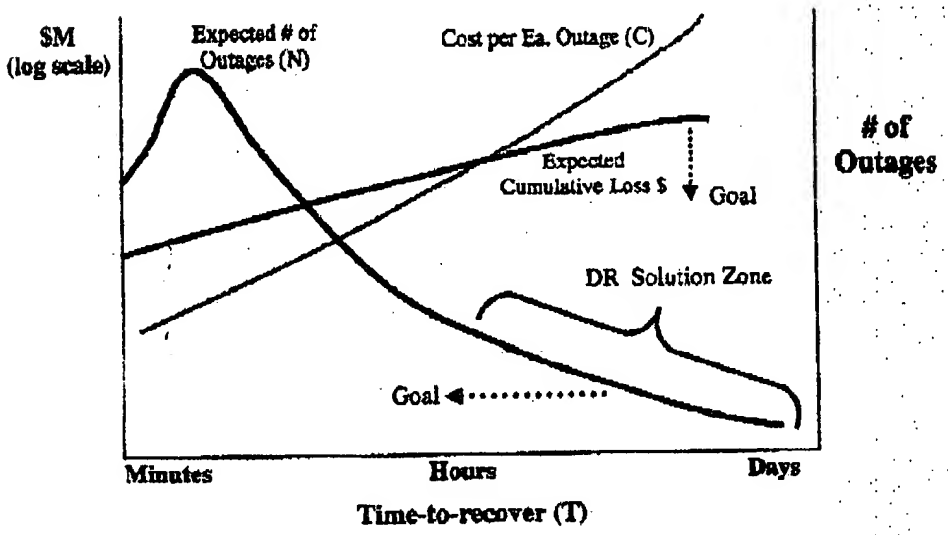
continuance and even disaster recovery (DR) is becoming necessary in many Web-based businesses.

The following section outlines a method and tools to conceptually evaluate a company's need for business continuance and apply techniques and measurements to assess its business value to a particular application. Notably, the approach builds upon concepts developed in previous sections of this paper.

Customer feedback indicates that considerations on business continuance justifications follow this general thinking:

1. In a given period of time (e.g. one year), outages will occur over a range of recovery times (minutes, hours, days, etc.)
2. Some N number of outages will occur within each recovery range based on a probability P.
3. The business impact (C = cost) of each outage (i.e. lost revenue/productivity/customers) increases as a function the magnitude of the failure (i.e. T = time-to-recover).
4. The degree of business impact (C, cost of downtime) *times* (T, time-to-recover) = Expected Lost Dollars [C X T = Expected Loss] for a given outage.
5. The cumulative loss to a business in a given year equals the sum of the costs of each outage over some N number of outages (see Figure).

Assessing the Value of Business Continuance



Simply stated, the business goal of a continuous application solution is ***a decrease in the time-to-recover at a much lower solution cost.*** As it relates to the above chart, the business

continuance value proposition is to shift the # of Outages curve to the left (i.e. faster recovery times) thereby reducing the Expected Cumulative Loss (per year).

A Business Continuance Value Model would therefore focus on three primary factors:

1. Costs including: Business impact of downtime (which increases as a function of the magnitude of the failure) and solution costs (Operational Costs)
2. The probability (P) of a failure (expected number of failures per year → N)
3. Time-to-recovery (T)

Each component of the model can be quantified in hard dollar terms to enable an expected loss calculation as a function of business impacts, expected failure rate and recovery times. Value is then calculated as follows:

Value of a Continuous Solution = Reduction in Loss

Manage Assets and Resources Proactively

Most companies have generally accepted approaches to hardware and software asset management. Not surprisingly, however, few have truly accurate views of staff productivity and consequent morale issues. Our research indicates that typically companies are unaware of between 30-60% of the hidden costs related to poor staff utilization.

This problem is especially acute in client/server environments where Unix and especially NT servers are springing up across the entire enterprise. Typically, unlike most mainframe installations, staff expertise is not aligned to a specialty area (e.g. network management or storage management). Rather frequently, a portion of a staff person's time is spent on each management task. This makes tracking staff time difficult and often results in poor hardware, software and network utilization.

Time in motion studies, proactive solicitation from employees on improvements needed, formal performance reviews and leading-edge training are common attributes of IT leaders. What is different in the New World Data Center is the increased emphasis on utilizing external services where appropriate. We believe companies need to develop longer-term plans with regard to the use of external services to incorporate them more aggressively as they mature.

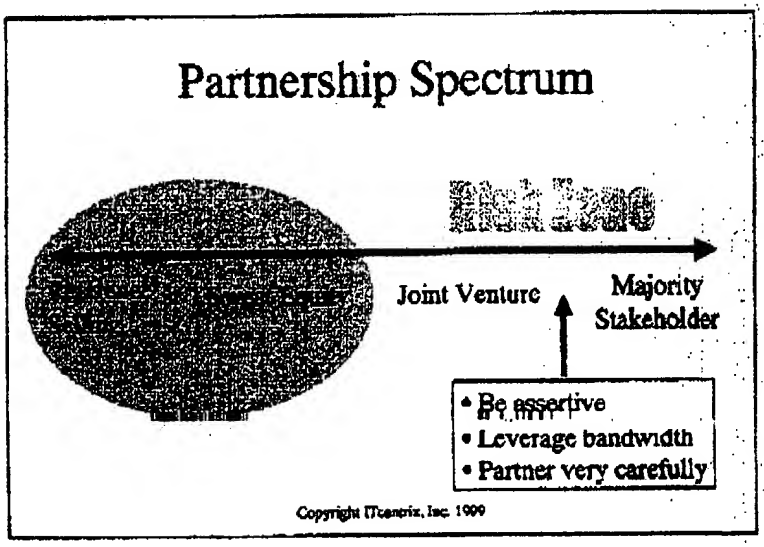
Partner Sensibly and Simply

Many companies' key partner lists are made up of suppliers and contain little substance. Rather we believe the emphasis of partnerships should be on adding complementary value to include factors such as:

- Increased coverage
- Improved customer value
- Knowledge transfer
- Improved market awareness
- Increased revenues

Importantly, complex partnership deals are doomed for failure and a strong emphasis should be placed on clear goals and results with a vision toward extending future value.

As it relates to New World IT, a primary focus should be on setting standards to improve interoperability and time-to-market. A range of partnership options should be considered from lower risk reference selling (exchanging ideas and leveraging customer contacts) to full blown joint ventures (see following figure)



This slide represents the spectrum of choices for a more full-scale market effort beyond simply being a passive provider of products or services. The "Risk Zone" is not intended to represent advice to avoid an initiative, simply to note that if companies decide such an approach is warranted we believe the points in the box describe critical success factors for today's Internet economy. They include:

- Aggressive entries into markets with high expectations and visible marketing

- Accessing, where possible, the spate of Internet-related funding that is available to those companies with Web potential
- Leverage huge investments in infrastructure that are underway by telecommunications and cable companies
- Be wise about selecting partners that have complementary businesses

Other partnership considerations include using direct sales and service organizations and potentially offering "freeware" in exchange for a piece of the revenue action from the partner/end service provider. Numerous scenarios could work including:

- Reference selling for a commission
- Trading product or service for a portion of the revenues
- Trading both of the above for equity in a company
- Commitments to buy a particular partner's solutions
- A combination of all of the above

Remember also, that while so-called freeware strategies are in vogue in the Internet economy, those products and services that lend themselves to near-infinite economies of scale (with volume) will likely prove the best candidates for trade.

Examples include software, certain services and leveraged device/service combinations (e.g. cell phones and cellular services). Products and services with less attractive marginal economics (e.g. free/cheap PC's and cheap/free Internet access) are less likely to produce the desired results as the profits will tend to go to one partner only (or neither).

Rethink Make V. Buy Strategies

"We outsource everything that can be reliably handled externally and is not of significant business benefit to our organization. This, in part, means we are moving from a programming-oriented operation to one that is more focused on integration and managing relationships that deliver value."

-CIO of a Major Financial Institution

Outsourcing is being driven by a number of trends that relate to the difficulty corporations have today in retaining staff and incredible pressures on rolling out new applications. Compounded by Y2K fix efforts, these issues make outsourcing a logical consideration. Lower network costs and thin computing models also contribute to the viability of the concept. Finally, the blending of network and software economics into a new services economy (i.e. the ability to provide mass customization at much lower costs) make new forms of outsourcing a potentially attractive business proposition for companies.

Outsourcing is taking new shape. Dominated by traditional services companies like EDS and CSC, outsourcing is seeing new,

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Outsourcing is taking new shape. Dominated by traditional services companies like EDS and CSC, outsourcing is seeing new,

specialized players focused on applications "renting," infrastructure outsourcing for items such as storage and network capabilities to staff and employee outsourcing.

These trends underscore the economic attraction of customized services. In the Pre-Web era, computing economics became well-understood in the various IT segments. Specifically, hardware had some level of scale economies (e.g. cheaper component and better manufacturing efficiencies) while software afforded very attractive profitability (e.g. Microsoft). The incremental cost of software delivery went to nearly zero as volume increased. Services were almost opposite to software where the greater the scale (volume), the larger the expenditure required to meet demand (mostly staff costs).

In the Post-Web era, however, customization is possible in very high volume by combining networking economics (Metcalfe's Law – "the value of the network increases exponentially as the number of network connections increases") with software economies. Hence mass customization in a Web-based economy tends to take on software-like economics. Lack of standards lock-in remains a major difference between the Pre-Web software (e.g. Microsoft) and Post-Web services (e.g. AOL) models. In the post-Web era, brand and volume become the key competitive weapons.

The implications for corporations are that increasingly, pockets of resource will be more centrally located to serve a more diverse set of customers. Computing and network "power" will increasingly concentrate within telco's, ISP's and outsourcers, making them exceedingly qualified managers of technology products and services (and notably a more important distribution channel).

Many have equated the rising momentum of services such as applications outsourcing to the return of the Timesharing model. There are major differences, however, particularly in the cost factors involved. Whereas processing power and telecommunications were the expensive resources in the days of timesharing, staff is the major element of cost in the network economy.

Increasingly, CIO's want to manage IT like their companies mange phone systems-- in utility-like fashion. The network services model is seen as the most viable path to this reality and will increasingly become a more common consideration in IT decision-making.

The simple message is strive to be the market leader in your industry for utilizing improved communications technology. Push communications suppliers hard to develop more competitive and mission critical service level guarantees. Importantly, communicate your strategy to your external partners as this will help smooth inevitable bumps in the road.

Design Flexibility into IT Infrastructures

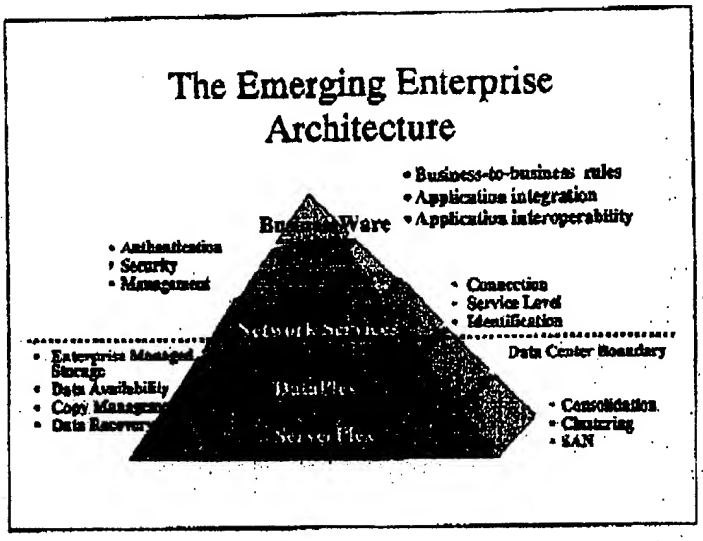
Time to market is becoming the single most important competitive differentiator for companies. By focusing on IT infrastructures that prioritize business flexibility, companies can add significant value by accelerating cycle times. Investigation and investment in technologies that foster a flexible infrastructure that enable an "any-to-any" topology are warranted in our view. Specifically, working toward an approach that allows any client, to access any application, on any server, to any data, independent of platform.

The following figure gives a framework for thinking about the architecture of the New World Data Center. It identifies five fundamental layers of an infrastructure that must fit into a seamless whole to meet the business and service level requirements of the organization; these include:

- **ServerPlex** – a set of tightly and loosely clustered servers.
- **DataPlex** – A storage infrastructure that is managed separately from servers and provides an any-to-any topology between data and applications.
- **Network & Client Services** – The infrastructure that connects applications to clients and other systems both inside and outside the organization.
- **MessageWare** –a set of services that provides communication between applications in a authenticated and secure manner.
- **BusinessWare** –A set of services that logically connects businesses together and provides a business process to business process infrastructure.

The balance of this position paper will drill down into each of these segments and provide specific information that will assist in the development of the framework.

Each discussion includes an overview of the state of the technology today, key issues and drivers of change and a view of the future capabilities in each layer.



ServerPlex

The bottom layer is the land of the servers, the workhorses of the data center. Today servers are organized as islands of computing, in a variety of different topologies. Applications run on a different platforms according to the "strategic fit" requirements of the application and organization.

- General applications run on "Open" Unix and NT servers, with NT applications being, in general closer to the workstation, and Unix systems being closer to the Network.
- A variety of specialized systems focus on specific application needs. Mainframes from IBM, Hitachi, Fujitsu/Amdahl, Tandem and Unisys meet the needs for high volume very reliable and rapid recovery systems – at a price. Systems like AS/400, and HP's 3000 series are mini-mainframes with similar characteristics. Novels NetWare is increasingly focused on network management.

Typically, one system holds the "data of record", and the others work off copies of this data. This data is moved between the islands of computing with a complex series of data transfers. Batch or offline processing is a standard way of dealing with re-synchronizing data across the set of systems.

Issues with Servers Today

There are numerous challenges with server deployment as organizations move towards the New World. Batch windows are under increasing stress. Data movement between servers is more complex. The LAN infrastructure is becoming increasingly a bottleneck as systems become larger. Managing the copies of data from an application design, application development and application deployment standpoint is a increasing problem, often manifesting itself in inter-department "disputes" about who owns the data of record.

Data warehousing systems find it difficult to move, load, synchronize, and clean data from an increasing variety of sources as user departments try to lower "time-to-decision".

While automation and operations of specialized platforms (e.g. mainframes) is generally good, the operation of open systems is less professional and automation rudimentary. Service level agreements are specific to applications and availability of open systems is patchy.

In addition, staffing levels are often high. Mainframe staffing tends to be specialized by function, while staffing on open systems is more general, and focused on platforms and groups of systems. As a result, fierce and unhelpful turf wars often break out over the merits of different platforms and vendors.

Management of resources across the data center tends to be rudimentary today. Spare resources on one system cannot usually be used by other systems, hence utilization of open servers is painfully low, with 30% utilization of servers viewed as a major achievement.

ServerPlex in the New World Data Center

As servers continue to get cheaper (40%/year price/performance improvements) and processor becoming more powerful (60% performance improvement/year) servers are becoming more specialized. The number of processors in systems is increasing with the advent of NUMA (Non-Uniform Memory Access). Partitioning systems so that multiple operating systems can run on large systems with flexible boundaries between them will become the norm over the next three years.

The most important technology innovations coming in the near term are the result of much improved high-speed communications between servers. Most Global 2000 installations will have four levels of inter-system communications, including:

- **LANs** – These will be upgraded to Gigabit Ethernet capability and will focus on communication between large numbers of users, systems, and low speed

peripherals such as printers. The bandwidth will increase significantly. However, these networks will not be sufficient to deal with the sustained data movements or the low latency requirements needed for typical application datasets. In general, Servers will decrease as a LAN management device as network vendors provide more specialized equipment to provide these functions.

- **SANs** – Storage Area Networks are rapidly coming of age and moving from a mainframe niche (ESCON) to Open systems (hubs and switches). The connection of all I/O is moving rapidly from a copper based medium to Fibre (which extends bandwidth and distance). Switches from Vendors such as Brocade, Ancor, McData, and Vixel provide the capability of implementing any-to-any topologies between Servers and I/O. As such, SANs are somewhat mis-named and perhaps should be referred to as ***System Area Networks.***

  SANs are more expensive than LANs per connection, but provide much better bandwidth and latency characteristics. While leading edge installations are implementing SANs today, most companies are waiting for vendors to provide packaged solutions. In general, SANs will be homogeneous (i.e. confined to a specific server environment) in the near future, with heterogeneous SANs several years away from general deployment as standards mature. The norm for customers will be to run "cloudlets" for the next several years.

  The exploitation of SAN will be through software that will provide the connectivity and systems independence of I/O. Leading contenders for providing the new "Systems NetWare" or SAN Operating System include Veritas and Legato, with Network Attached Storage vendors such as Auspex and NetApps also in the chase.

  The business case for SANs is impressive. Operational savings (from improved staff and equipment utilization) is significant, while improved availability and increased business flexibility (or time to market for new applications and application extensions) will provide an increasingly large share of the benefits as SANs mature.

- **High-Speed Interconnects** –Another important trend is to cluster systems. One major driver behind this will be the requirement for higher availability at much lower cost, as N→ 1 fail-over systems become possible (i.e. backing up multiple servers with a single failover system versus today's propensity to have multiple failover servers per individual application server. Another driver will be the requirement to manage workloads across a set of loosely clustered systems, known as administrative clustering. Similar to tightly clustered systems, loose clusters will require an operating system, file systems, and systems management functions to take on "Pan system"

capabilities. There will be an increasing requirement for very high bandwidth very low latency communication between nodes within the data center. This is likely to be carried across high-speed interconnects, which are emerging from companies such as GigaNet at very low prices. The likely emergence of the VIA standard from Intel as a cross platform initiative will accelerate the use of these networks by key ISVs such as DataBase vendors.

- **WAN Networks** –Servers will have less and less to do with Wide Area Networks as this work is taken over by specialized Network equipment and increasingly outsourced. However, in the area of disaster recovery, the usage of the increasing bandwidth between data center sites or outsourced sites will increase significantly. The "rule of five" should be applied where possible – the best networks are five feet apart, and the best disaster recovery sites five miles apart.

A key trend that will continue within the data center is the momentum to re-centralize systems either in site glass houses (or location centers). This trend will accelerate the implementation of SANs. Increasingly, Data centers will move from management by system to management by discipline, with specialization in operational automation, storage management, and network management across platforms. Data centers will continue to be populated by a variety of different platforms, and the fundamental organization of the data center will change from being servers surrounded by storage to storage surrounded by servers. Which leads to our discussion on storage.

Storage Today

Storage today is primarily directly attached to servers, with a fast growing centralized component based on shared storage between servers from companies like EMC and Hitachi. Management of storage is distributed among many disciplines, with an administrative arm here, a database administrator there, and a purchasing officer somewhere else.

Storage on open systems is bounded by the limitations of SCSI connections, both it terms of distance and in terms of pathing. Fibre has been installed for a long time on mainframe systems, and has greater than 90% penetration. Mainframe "SANs" suffer from the lack of interoperability and the lack of multi-node switching, as well as expensive components.

Storage Issues

In a recent survey ITcentrix found that the top three issues for

1. **Back-up windows** – the dramatic increase in size of the data on systems, and the lengthening of operation times for on-line systems have both conspired to make back-up windows a major problem. In a similar survey, the

number one cause of unavailability was found to be "batch overruns" extending back-up windows.

2. **Difficulty managing growth** – the most common statement from storage managers is "they tell me yesterday that storage is today for a project that was started a week ago." The infrastructure to handle the back-up of these systems, and the downstream work in managing copies and distribution of data throughout the data center are also under pressure. One of the frustrations is that there is a lot of data that is available but unusable, whether because of access constraints or because of bandwidth constraints.

3. **Performance management** – the majority of performance issues come down to data management, from allocation of the right type of storage to the placement of data sets. In specialized systems like mainframes, there are generally good tools to manage performance. In particular, the end-to-end architectures of these systems, which include hardware, operating system, and database, means that "probing" the system is much simpler. Open system storage managers are frustrated at the lack of performance management tools, and the transitory nature of storage performance problems. One of the fundamental problems is the lack of coordination between Unix and NT operating system developers, database developers, and hardware developers.

Storage is becoming cheaper and denser. But there are two important aspects of storage that is not improving – that is the data rate off the platter, and the access time to that data. These are constrained by the mechanical properties of spinning disks, and have not improved significantly over the last twenty years – disks rotated at roughly 3,000 RPM in the past, and are only at 12,000 today; a 4X improvement in twenty years. Considering capacity improvements have increased by approximately 10X in that same timeframe underscores the issue.

This leads to an increasing imbalance between the processor and storage technologies. This limitation is somewhat less important for traditional on-line systems that access small records but of much greater importance when trying to move large amounts of data between systems, i.e., to a data warehouse application.

The primary techniques that data centers have used to minimize these problems are to install a separate network for back-up, and to use caches (when the application is cache friendly), to improve the alternative pathing to data, and to provide parallel access to data.

The most fundamental issues with storage are not the cost. It is the cost to manage. As one storage manager said recently "I can afford to buy all the storage I need – what I can't afford is to manage it". Moving to professional storage management is an imperative for the data center of the New World.

The DataPlex of Tomorrow

The most important technologies for Storage are the same as for Servers – an improvement in the communication fabric between servers and I/O. Fibre breaks the distance limitations of SCSI. Although the standards are not yet complete, pragmatic fibre implementations are being implemented today. The development of Fibre and SANs is likely to follow that of the LAN in the early years, where the major problems where initially hardware compatibility, but where eventually a number of standards became de facto, and the software and hardware were able to complement each other.

Not all data will be connected to a SAN, and not all data connected to a SAN will be switchable. As always, there will be a mix of technologies in the data center. However, strategically thinking CIOs have already implemented a Fibre-first policy for storage, as this will protect investment in the development of the dataplex of the future.

In talking about Dataplexes, it is important to stress that there will be many Dataplexes in an installation. The break between them will be pragmatic – based on a combination between line of business, application type, and platform. The characteristics of a Dataplex are that the management of access to data is accomplished across the servers, not by the server of origin of the data. This allows enormous flexibility in the management of the data center as a whole.

Moreover, software enhancements to systems and data management are expected to allow dynamic allocation of storage, N→1 fail-over scenarios, and significantly better utilization of storage and server cycles. Some of the most important systems software to emerge will be the workload and dynamic workload management suites, which will bring to open systems what is currently available only in mainframe Sysplex environments.

This logical division between applications, servers, and data will allow center-wide policies to be implemented significantly more easily, and dramatic steps to be taken in the automation of data center processes and procedures. This in turn will lead to more available systems (operators are still the most unreliable component of a system) which are cheaper to run.

Users should expect that the appropriate server can be applied to the data, and servers and storage will increasingly be expected to be neutral to the specific file structures and formats. Users should focus on hardware and operating system vendors that understand the emerging imperatives on the data center of the future.

The Dataplex will allow central management of the typical backup, recovery, and hardware procedures. Again, specialized servers (or storage controllers) will offload the work from the application servers, and lead to greater specialization of servers to running applications, and away from managing networks.

The pressure of external users, and applications that are of increasing mission criticality brings some interesting implications to data recovery and disaster recovery. Although the probability of a long outage is very small, the impact can be enormous. Readers of the e-bay saga need go no further in understanding the dramatic impact outages can have on reputation and stock value.

Using similar constructs as described in previous sections of this report, the probability of an outage of greater than four weeks is assessed as only one per hundred years, yet its impact on the total expected loss is greater than all the outages of less than one hour combined!

As discussed in the section on Business Continuance and shown in figure xx titled "assessing the Value of Business Continuance", the disaster recovery imperative is to shift the # of Outages curve to the left (i.e. faster recovery times) thereby reducing the Expected business Loss.. As such, it the business imperative is focus on, measure and decrease the "time-to-recover for data loss". As a strategy this is much more effective (and easier) than lowering the number of incidents, many of which are outside the control of IT.

The traditional approach is either to outsource disaster recovery to the many specialist vendors offering such services, or to have a number of data centers in different areas of the country, each of which backs up of the other. Apart from cost, the major problem is that it is almost impossible to rigorously test a disaster scenario. The once-a-year test checks that tapes can be read, and often satisfies a Governmental requirement, but little more than that.

The availability of Fibre over distances of five miles or more means that users should re-evaluate their disaster recovery strategies. When the time to recover is taken into account, the business benefit (calculated as the expected data loss) of locating backup sites within Fibre distance is often significantly better. Of course care must be taken that the major causes of natural disaster (such as being in the same flood plain) are managed. The implementation of SANs over these longer distances is still relatively new, but again the pioneers are blazing a trail that the rest of us should be planning to follow within a year or two.

Specialist companies are now emerging that will provide data outsourcing, both for personal systems (companies like Atrieva) and for data centers (Companies like Storage Networks Inc.). The latter is leveraging local Fibre networks in major cities to provide data outsourcing services.

Networking Services

The importance of establishing internal networks within the data center has already been discussed above. The discussion centered on the importance of assessing the characteristics of the network that were best suited to the system and application characteristics.

In exactly the same way, external networks do and will continue to have to reflect the same requirements. Exciting new services such as IP value added networks (VANs) are available that can dramatically reduce network costs. Emerging are service level contracts that give guarantees on bandwidth, latency although leading customers still complain of inadequate commitments from vendors.

Networking & Client Services Today

Today's Network Services are either IP based or are rapidly moving to being IP based. The typical installation has a mixture of traditional leased lines and newer shared services.

Clients are dumb terminals and fat windows based desktops. These systems on the whole are within the corporation, though an increasing number of customers, suppliers, and business partners have access to the network. This will only increase as customers bring access and companies install capabilities like kiosks in the field.

Issues with Today's Networking

A major issue that users struggle with today is how take advantage of the emerging new services against a set of telecommunication suppliers that are intent on maintaining the revenues from their existing highly profitable traditional voice and leased line business. As such, the new services have profiles that make them attractive to start-up organizations, but lack some of the basic management and scaling features required by the global 2000 data centers.

For international customers, the provision of telecommunication services overseas is patchy to say the least. In Europe there are countries such as Scandinavia and the UK where the communication infrastructure has been liberalized, and communication services are at least the equivalent of the US. In other countries such as Germany, France, and Japan the government has moved far more slowly to deregulate and open up the telecommunication sector, and prices are high and services poor.

Future Networking Services

The world is rapidly moving towards a telecommunications model where data and data services are charged for, and voice comes for free. The bandwidth capability of new circuits is truly staggering, and the science of photonics goes ahead of all other computing technologies. At the same time that bandwidth is becoming universal, the speed of light and the latency of switches still brings significant constraints to providing low latency.

The importance of establishing internal networks (SANs and High-speed Interconnects) within the data center has already been discussed above. While these networks will mostly be managed separately from the LAN and WAN, the same principles apply whereby the emphasis is placed on the importance of assessing the

characteristics of the network that is best suited to the system and applications being supported.

In exactly the same way, external networks do and will continue to have to reflect the same requirements. Exciting new services such as IP VPN (Virtual Private Networks) are becoming available which can dramatically reduce network costs. The leading edge telecommunication companies are starting to provide robust service level contracts that give guarantees on bandwidth, latency and availability. Over the next few years these are expected to give service level characteristics that are equivalent to the best run internal networks, at significantly reduced costs.

Probably the most important change in Networking is the way in which the networking services will be delivered. The telecommunication companies are highly motivated to keep telecommunication spending increasing, and they will continue to emphasize services as both a differentiator and as a source of revenue. This is likely to be a win-win situation for users, as outsourcing of these types of services is an already proven model with voice services. Today very large voice services can be managed by a single person in a corporation. Everything, from the provision of phones to the setting up of user phone profiles is outsourced. Data services will almost certainly go the same way as voice services, and be effectively outsourced to the telecommunication providers.

CIOs should be driving to the same model for data networking services. The provision of network services will and should be increasingly outsourced, and the provision of "data-tone services" will be the norm. The implication of this is a continuance of the rise of importance of the telecommunications manager as pivotal to the service level performance of the installation.

Managing future clients is probably going to be one of the greatest headaches for the CIO. No longer can an organization dictate the standards that are going to be used. In general, clients will be thinner network access "devices", (such as palm pilots, cell phones, pagers and inexpensive PC's) and companies will have to react quickly to changes that their customers, suppliers, and partners will be driving. IT can dictate what kind of servers they have in the data center, but it cannot regulate what is going to be in the data centers of business partners. Interoperability and flexibility with the ability to support multiple standards are going to be the norm in the New World Data Center.

MessageWare & BusinessWare

The two other layers of the New World Architecture which are essential to the deployment of the externally facing applications of the future are the MessageWare and the BusinessWare layers.

Today's MessageWare and BusinessWare

While the world has moved on from the tape transfer of corporate data (except for seismic tapes), today's MessageWare standard is

primarily simple kinds of file transfer. Some organizations have started to implement MessageWare components such as IBMs MQ series with a guaranteed delivery architecture within the corporation. EDI systems have for some time provided similar services for companies within an industry.

Issues with Today's MessageWare and BusinessWare

Simply put, today's MessageWare offerings are not robust enough or secure enough for the rough and tumble of the Internet. The working systems are based on the Sabre protocol, in proprietary EDI systems, and within a single vendor's ERP system such as PeopleSoft.

A messaging infrastructure is required to be able to reliably send data between applications, both within a corporation and between corporations. It has to deal with the authorization of the applications that are communicating, and the security and auditability of the communication.

MessageWare of the Future

This technology is a vital component in the ability to move from a file transfer orientated system to a transaction based intersystem communication. Many vendors are claiming that they have working product. As the technologies emerge, users will need to select their vendor on a partnership basis as both partners iron out the true requirements of inter-company system to system communication.

The potential rewards are phenomenal. The original on-line system obviated the need for data entry specialists (e.g. punch card operators), drove data input to the source, improved business cycle times and improved data quality. In exactly the same way, MessageWare and BusinessWare will move the source data out to suppliers, customers, and partners directly. Companies who can succeed in providing a reliable (both from a systems and business point of view) infrastructure can expect enormous savings in people costs, IT quality and business cycle time reduction. For many companies, survival will depend on the development of such a capability.

BusinessWare of the Future

The other half of the services that will be required to reliably connect business will be frameworks and business models that logically connect businesses together and provide a business process to business process infrastructure.

For example, an individual is happy to buy a system from Dell Computer Corporation over the Internet in the way that Dell wants to do it. However, if GE wants to buy PCs and a million other items every year, it wants a common purchasing system for the whole corporation. Increasingly, buyers will expect suppliers to comply.

Internet purchasing systems are not yet up to this task. To resolve these issues requires agreeing to a common framework. To get reliable and fast implementation across company boundaries is almost certainly going to need the use of business objects and object based technologies.

This is one of the most important areas for partnering with vendors, and working with business constituents (including potential competitors). Solutions will initially be difficult, time-consuming, and very industry based. But the rewards to the companies that figure solve this problem first are going to be so compelling that the every CIO should set this capability as a key strategic objective, and constantly monitor progress toward the goal.

Conclusions

The New World Data Center – What's Different?

Following a path similar to the one suggested in this paper will likely result in IT vying for a larger share of corporate resources. Importantly, however, the New World Data Center will focus as a communication center rather than a pure data center. Additionally, it is likely the organization will serve more external than internal users and make greater investments in communication-specific than general-purpose IT.

A paradox of this approach is that although the benefits can be enormous, execution is not trivial. As such, implementers should expect to spend more on outside services than internal staff people. This makes setting standards even more crucial, especially when considering connections between customers, suppliers, & partners.

The bottom line is the New World Data Center will allow IT to be perceived as the major corporate facilitator of a network-centric vision - A vision that includes global connections, practical interconnectivity between divisions and the external world and an emphasis on e-business application enablement.

The New World Data Center encompasses all levels of IT and certain relevant levels of business management including:

- Senior corporate executives
- Senior IT executives
- Data Center Management
- IT Architects
- IT/IS/MIS Management
- Applications Development Managers
- Network Management
- Systems Integration and Outsourcing Professionals
- Line of Business Management

- Financial Management concerned with IT
- Liaisons to external partners

Consider that the typical Global 2000 data center of today has the following attributes.

- Multiple data and location centers – connected through a variety of private leased lines, emerging virtual private networks and the Internet for certain applications like email.
- Mostly isolated and private network traffic managed and controlled by the enterprise.
- Mature, legacy networks (with strong directory knowledge – e.g. SNA) interspersed with chaotic yet highly flexible, lower cost shared networks.
- An abundance of general purpose resources (e.g. servers, storage, OSes, etc.).
- Client devices are general purpose, standard and relatively stable.
- Systems management is server (as opposed to network) focused.
- Software elements are focused on solutions to specific business processes with some limited interconnection between enterprise divisions and lines of business.
- Applications are platform-specific and not well-integrated (e.g. mainly islands with spreading tentacles).
- Outsourcing efforts are mainly focused on broad categories (e.g. application maintenance).
- Services are tailored to solving unique problems but tend to be high cost, less replicable and difficult to customize.

The Global 2000 New World Data Center of the Future will have the following characteristics:

- Fewer but larger internally-managed data centers with increasingly outsourced location centers.
- Much more external network traffic on shared, public networks managed and controlled by Telcos/ISPs.
- Highly flexible, lower cost shared networks with much greater directory knowledge, security and guaranteed service levels - managed externally.

- Increasingly function-specific hardware and software resources (e.g. Storage-only networks).
- A plethora of non-standard, function-specific clients (e.g. cell phones, PDA's, Kiosks, etc.).
- End-to-end network management of enterprise service levels.
- Software built on strong interconnections within and increasingly outside the enterprise.
- Applications designed independent of storage and network topologies.
- An accelerated trend towards application outsourcing (e.g. outsourcing email and other business applications).
- Services are more network-based, highly customizable with much greater scale economies.

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David Vellante and David Floyer have forty years of combined experience as consultants and business professionals in the IT industry.

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